Chapter XV.--Future project expansion

Unallocated water in the Colorado River Basin is believed to be of sufficient quantity to permit expansion of the Initial Development into a Maximum Gravity Diversion project, provided the water were made available for diversion by Upper States Compact agreement. Further investigations involving the expenditure of an additional $4,425,000 would be required to determine accurately the amount of Western Slope water divertible, the most economical route for diversion to the Eastern Slope, and the amount of hydroelectric power that could be generated. Alternate routes and an investigation program may be found in Appendix D "Alternate Routes (Status Report)". Only a general description of the plan for expansion indicating overall feasibility based on existing rough preliminary data is presented herein.

MAXIMUM GRAVITY DIVERSION

This possible expansion of the Initial Development would enable the annual diversion of an additional 595,000 acre-feet of water from the Colorado River Basin to the Arkansas River Basin which would make a total cumulative diversion with both phases of about 655,000 acre-feet each year. About 400,000 acre-feet of the new diversion could be obtained from existing flows of the Sixte, East, and Taylor Rivers in the Gunnison River Basin. The remaining 195,000 acre-feet would consist of rediversions of water from Anthracite Creek, which is a tributary of the North Fork Gunnison River, and from the upper Crystal River and Maroon, Castle and Difficult Creeks which are tributaries of the Roaring Fork River.

Potential features of the Maximum Gravity Diversion as well as features of the Initial Development are shown on Exhibit 8 located in the back of this report.

Reconnaissance investigations and preliminary studies of water supply have been made for this project expansion plan, but the problems are being studied further to refine the data and to assure that no potential uses of water in the Western Slope area will be overlooked. That work has heretofore been delayed because of lack of funds in Region 4. It is believed that data obtained from the restudy will not materially decrease the amount of water planned for transbasin diversion, and that the allocation of water to Colorado by the Upper States Compact will be the governing factor in the final and total amount that actually can be diverted. More careful investigation and exploration may decrease the unit cost of diversion.

Region 4 is also studying specifically the water requirements for irrigation and for other uses on the Gunnison River between the towns of
(Chapter XV.--Future project expansion)  
(MAXIMUM GRAVITY DIVERSION)

Almost and Gummison. These studies may reveal a need for additional provisions to preserve stream characteristics and minimum flows at critical points for which allowance would be made. It is believed, however, that the potential amount of divertible firm water would not be affected materially.

The potential Curocaniti Reservoir would be created by the construction of a concrete arch dam 600 feet in height on the Gummison River immediately below the confluence of the Cimarron River. Normal water surface elevation would be 7,335 feet, and about 6,000 acres would be inundated. The reservoir would contain a 30,000 acre-foot dead-storage pool at elevation 6,920 feet for recreation and for fish and wildlife. The capacity of 1,070,000 acre-foot would be sufficient to meet regulation and replacement storage demands of the Uncompahgre Irrigation Project and other irrigation water users along the Gummison River for the probable maximum amount of development. Potentialities of an enlarged Curocaniti Reservoir for long-term or cyclic storage, to meet downstream requirements under the Colorado River Compact, have been considered, but additional studies and investigations and conferences with the interested parties are needed before conclusions can be reached. Part of the replacement would be in exchange for use of the Taylor Park Reservoir described subsequently. A hydroelectric powerplant would enable the generation of considerable electrical energy.

Inasmuch as Region 4 proposes participation in this reservoir to at least the above capacity and possibly to a considerably enlarged capacity, a reservoir designed exclusively for replacement uses independent of Region 4 requirements has not been considered. Under the present plan, the Curocaniti Reservoir is considered as a Western Slope development and replacement, to be integrated with the Gummison-Arkansas Project. The proportional part of the reservoir that is chargeable to project replacement has been assessed against the project.

A diversion of about 60,000 acre-foot could be made from the Anthracite Creek watershed at elevation 9,300 feet. The water would be collected by 24 miles of conduits and tunnels and conveyed to the portal of the main diversion tunnel in the Dark Canyon. That tunnel, 4.5 miles long, would carry the intercepted waters through the Cascade Mountain to Poverty Gulch, a tributary of the Slate River.

An average of about 88,000 acre-foot of water per year could be diverted at elevation 9,500 feet from the upper Crystal River, a tributary of the Roaring Fork River. The water would be conveyed by 12 miles of tunnels and conduits to the west portal of the Crystal River diversion tunnel. That tunnel would convey the water 6.8 miles through the Elk Mountains to the Slate River.
Diverted waters from Anthracite Creek and from the Crystal River would join the natural waters of the Slate River and flow down that stream approximately 12 miles to a point about 1/2 mile above the confluence of the Slate and East Rivers. The combined intercepted waters of Anthracite Creek and the Crystal, Slate, and East Rivers would then be diverted and conveyed along the east side of the East River valley by 1 mile of tunnel and 9.5 miles of canal to the potential Almont Reservoir. Water from Conant Creek would be intercepted on route.

The potential Almont Reservoir, which would be created by a concrete arch dam about 415 feet in height on the Taylor River, approximately 4 miles northeast of the town of Almont, would have a capacity of 385,000 acre-feet, of which 25,000 acre-feet would be dead storage below elevation 8,295 feet. The normal high water elevation of this reservoir would be 8,590 feet, and a lake with a surface area of 2,120 acres would be created. The primary purpose of the Almont Reservoir would be to regulate water for diversion to the Eastern Slope although power would be generated at the dam by uniform water releases incident to fish culture.

From the Almont Reservoir, the potential Gunnison-Arkansas Tunnel at elevation 8,570 feet would divert water north and east 34 miles through the Continental Divide to the Arkansas River Basin. Auxiliary pumping into the transbasin tunnel would be necessary at times of low water level in the Almont Reservoir.

Diversion of an average of approximately 47,000 acre-feet annually could be made at elevation 10,150 feet from the upper Maroon, Castle, and Difficult Creeks drainages which are tributary to the Roaring Fork River. Water would be intercepted at various stream crossings and conveyed to the main diversion tunnel by 16.5 miles of tunnels and conduits. The main diversion tunnel would transport the water 5.5 miles through the mountain to the Taylor River where it would join the natural waters of the river and flow 11 miles to the Taylor Park Reservoir, an existing feature of the Uncompahgre Irrigation Project that was completed in 1937 by the Bureau of Reclamation. Projected use in the potential plan would necessitate enlargement of the reservoir.

The Taylor Park Reservoir could be enlarged by increasing the height of the present earth dam from 170 feet to 335 feet. The capacity at high-water surface elevation 9,500 feet would be 750,000 acre-feet and the surface area, 6,000 acres. The primary use of the enlarged reservoir would be to store and regulate waters for diversion to the Eastern Slope. Power could be developed, however, from water released into a vertical shaft leading to the transbasin Gunnison-Arkansas Tunnel and through a powerplant located underground below the Taylor Park Reservoir.
Water not diverted through the shaft would flow down the Taylor River about 10 miles to the potential Almont Reservoir. The capacity of the Taylor Park Reservoir now allotted to the Uncompahgre Irrigation Project near Montrose would be replaced by equivalent storage in the potential Curecanti Reservoir on the Gunnison River.

Divertible waters from the potential Almont Reservoir and from the enlarged Taylor Park Reservoir would flow eastward through the 34-mile Gunnison-Arkansas Tunnel which would emerge on Cottonwood Creek, about 3 miles above its confluence with the Arkansas River at Buena Vista.

The diverted water from the Gunnison-Arkansas Tunnel would enter the Arkansas Power Canal below the tailrace of the Princeton Powerplant. Thence it would join the Western Slope and Eastern Slope waters from the north. All waters, including accretions obtained on route, would be transported southward in the power canal to its terminus where the water would be used for the generation of electricity in the Salida Powerplant.

Water from the Salida Powerplant tailrace would flow through the Salida Power Drop-Browns Canyon Canal into a system consisting of 12 miles of canal and 5 miles of tunnel to the potential Wellsville Powerplant on the north side of the Arkansas River about 4 miles east of Salida and 1 mile west of the town of Wellsville. Additional flow could be intercepted from the Arkansas River at Browns Canyon by a canal 1.4 miles in length. After passing through the Wellsville Powerplant the combined waters would be returned to the Arkansas River.

The existing State Ditch near Canon City, which was never completed, would be rebuilt and extended to divert water from the Arkansas River for the municipal needs of that city and to supply additional water to the Ponceno-Beaver Park area. That plan would enable Colorado Springs to divert more water from the upper reaches of the Beaver Creek for municipal purposes. Enlargement of the existing Skagway Reservoir, owned and operated by the Southern Colorado Power Company, to 14,400 acre-feet and construction of diversion dams and a pipeline for the collection and conveyance of water to Colorado Springs for municipal uses would be undertaken by that city.

All other water would continue down the Arkansas River and into the Pueblo Reservoir, constructed under the Initial Development, which would be enlarged to 800,000 acre-foot capacity. The water would be stored and released as needed for irrigation and municipal uses. Enlargement of the Pueblo Reservoir would necessitate increasing the height of the dam from 180 to 221 feet above stream bed. The enlarged capacity of 800,000 acre-feet at flood storage elevation 2,945 feet would form a lake with 12,400 acres of surface area.
Additional downstream reservoir capacity could be provided by enlarging the existing Horse Creek Reservoir from 29,000 acre-foot to 100,000 acre-foot.

The increased water supply would enable the irrigation of about 225,000 acres of new lands which could be supplied water by extensions of existing canals and by the construction of some new canals. Laterals, and adequate drains would also be necessary. Areas to be irrigated have not been definitely selected. Additional land classification studies and more detailed surveys will be required before satisfactory routes and adequate designs could be made.

Municipal water supplies could be furnished to valley towns by means of a pipeline from the Pueblo Reservoir. The cost of the pipeline would be borne by the municipalities concerned.

The expansion features, when added to those of the Initial Development, would provide a total project transbasin diversion of about 655,000 acre-foot of Western Slope water to the Arkansas River Basin. In addition to alleviating the need for supplemental irrigation water, about 45,000 acre-foot of municipal water could be made available for municipal purposes and a total of about 225,000 acres of new land could be irrigated. Total hydroelectric power which could be generated would approximate 2.2 billion kilowatthours per year, thereby enhancing project repayment ability and providing a basis for further industrial expansion within the project area.

In order to make the additional water available to the Arkansas Basin in the shortest possible time, the gravity diversion system could be constructed without the secondary diversions from Anthracite Creek, the Crystal River, and from Maroon, Castle, and Difficult Creeks. These diversions could be added later in progressive order until the maximum gravity system was completed.

Costs

A rough preliminary cost estimate of the potential expansion features described previously amounts to $382,800,000, based on July 1947 prices. This cost when added to that of the Initial Development amounts to $523,271,000. Interest during construction would amount to about $56,620,000, and present worth of terminal salvage value, which is that value remaining after the 100-year period of analysis, would approximate $16,217,000.
(Chapter XV.--Future project expansion)
(MAXIMUM GRAVITY DIVERSION)

After the project is constructed, annual costs for operation, maintenance, and replacement to keep the various features in good operating condition, transmit the electrical energy to load centers, and distribute the irrigation water to the farms, would amount to about $3,836,000, based on a 50-year repayment period. When replacement costs on power features have been adjusted to a 100-year period of analysis for the purpose of determining the benefit-cost ratio, the annual operation, maintenance, and replacement cost would amount to about $3,935,000. The total construction cost plus interest during construction less present worth of terminal salvage value, when amortized over a period of 100 years with 2-1/2 percent interest, gives an annual equivalent cost of $15,394,000. The total annual equivalent Federal cost would then be $19,329,000.

Annual Benefits

Benefits from developing 225,000 acres of new land and furnishing supplemental water to 322,000 acres of inadequately irrigated land would amount to $7,018,000 per year. These benefits are measured by the increase in gross crop returns plus the increase in livestock income resulting from utilization of increased livestock feed and include indirect benefits.

Power benefits would approximate $19,480,000 annually.

Benefits from making available municipal water of good quality to cities and towns in the Arkansas Valley may amount to $1,205,000 annually. A flood control benefit of $1,002,000 and a sediment control benefit of $135,000 per year may be expected as a result of the construction of the Pueblo Reservoir. As in the Initial Development, recreational benefits total $109,000 annually. Indirect benefits of $5,023,000 annually would result from Bureau of Reclamation expenditures for project development. Benefits accruing to fish and wildlife from the Maximum Gravity Diversion were not available at the time this report was prepared. The total benefits of $33,926,000 exclusive of fish and wildlife, however, exceed the annual costs by a ratio of 1.76 to 1.00.

In addition to these benefits, numerous intangible benefits which cannot be evaluated, but are nevertheless real, would present a definite impact upon the general economy of the project area. These benefits would be an expansion of those enumerated for the Initial Development.
(Chapter XIV.--Future project expansion)

MAXIMUM GRAVITY DIVERSION EXTENSION

If the need for additional electricity should become critical, additional power could be generated by the construction of a series of tunnels to the mouth of the Texas Creek on the Arkansas River, then to Webster Park on Grape Creek and finally to the mouth of Grape Creek near Canon City with power plants at the places named. Interceptions could be made from the Arkansas River near Wellsville and Texas Creek. This extension would reduce the cost of power and could be built in accordance with an increased power market demand. About one billion kilowatthours could be generated annually making the project output total 3.2 billion kilowatthours yearly.

INVESTIGATION PROGRAM

Numerous studies remain to be made for the Maximum Gravity Diversion before feasibility reports on this plan for expansion of the project can be completed. About 10 years time should be allowed for completion of investigations. The estimated man-months and costs required for completion of feasibility reports are as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Man-mos</th>
<th>Est. cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water supply</td>
<td>200</td>
<td>$180,000</td>
</tr>
<tr>
<td>Designs and estimates</td>
<td>4,000</td>
<td>$2,400,000</td>
</tr>
<tr>
<td>Power studies</td>
<td>700</td>
<td>$430,000</td>
</tr>
<tr>
<td>Economic studies</td>
<td>700</td>
<td>$430,000</td>
</tr>
<tr>
<td>Project lands</td>
<td>1,700</td>
<td>$1,055,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7,300</td>
<td>$4,425,000</td>
</tr>
</tbody>
</table>

Water supply

In relation to the enlarged project the following studies and reviews should be made of the Western Slope water supply:

1. Reconnaissance of uses of the Crystal River in the Colorado River Basin and Anthracite Creek in the Gunnison River Basin above Grand Junction to determine the amounts of water available for diversion. This study was expected to be made by Region 4, Bureau of Reclamation, in 1948. However, funds were not available for that assignment.
(Chapter XV.--Future project expansion)

(INVESTIGATION PROGRAM)

2. Review of the limitations of diversions by reason of local uses on tributaries of the Colorado River above Grand Junction, particularly the Maroon, Castle, and Difficult Creeks, to determine more closely the allowances for future uses of water below the proposed diversion sites on the above-named creeks.

3. Additional studies to determine more closely the storage capacity needed in the potential Currecani Reservoir, or acceptable alternate reservoirs, for river regulation and replacement purposes in connection with the Gunnison-Arkansas Project.

4. Utilization of available records and currently accumulating data on present uses and practices along the Gunnison River to permit a more precise estimate of present and future requirements.

5. Additional hydrographic investigations in the Almont-Gunnison area, including Ohio Creek to the extent involved, to insure protection of existing irrigation practices and fish protection.

6. Determination of allowances for future uses of water for industrial purposes on the western Slope.

In the Arkansas Valley a continued study of water supply data and water uses should be made.

Designs and estimates

Preliminary surveys and geological investigations consisting of drilling and materials explorations should be undertaken to provide the information required by the Branch of Design and Construction for feasibility designs and estimates. These investigations would apply to the secondary diversions, Currecani, Almont and Taylor Park Reservoirs, the main diversion tunnel and the Salida-Wellsville power drop. The various powerplants would also be included.

When the Maximum Gravity Diversion has reached the authorization stage, classification of the most desirable land should be undertaken in detail.
Power studies

Concurrently with the progressive development of the project the power potentialities, markets, and transmission system should be re-studied in order to determine the type and time schedule of power development best adapted to the needs of the area. Special studies should be made of individual hydraulic features with particular regard to operation of the project.

Economics

Further studies of project expansion should be made on a continuing basis with an enlarged personnel. However, economic results on repayment ability and benefits for the remainder of the project included in this report are sufficiently accurate to indicate the desirability of continuing investigations to the limits imposed by political consideration.

Project lands

At present over 2-1/2 million acres have been classified by reconnaissance or semidetail methods or both.

In order to determine more accurately the extent and character of the lands and the ultimate development which might be expected with water to be made available by an expansion of the project, additional semidetail classification of some of the project lands should be made.
Chapter XVI.—Reports by cooperating agencies

FISH AND WILDLIFE SERVICE

The report by the Fish and Wildlife Service was not available at the time the Interim Report was published, but may be inserted at some later date.

NATIONAL PARK SERVICE

The report by the National Park Service is included on the following pages in its entirety as received by that agency.

Since the investigations and report were completed by the National Park Service several changes were made in the project plan. The studies and report by that agency include a comprehensive plan for the diversion from the Western Slope of 990,000 acre-feet of water to the Arkansas Valley. However, that plan was found to be undesirable and is now included as an alternate plan in Appendix D, "Alternate Routes (Status Report)". The Initial Development and the Maximum Gravity Diversion remain in the plan of development of the Gunnison-Arkansas Project. The following reservoirs are included in the two plans.

**Initial Development**
- Twin Lakes Reservoir
- Sugar Loaf Reservoir
- Pueblo Reservoir
- Western Slope Replacement Reservoir

**Maximum Gravity Diversion**
- Twin Lakes Reservoir
- Sugar Loaf Reservoir
- Pueblo Reservoir
- Western Slope Replacement Reservoir
- Taylor Park Reservoir
- Almont Reservoir
- Curecanti Reservoir

Thus the following reservoirs, which are discussed by the National Park Service in their report, are no longer included in the project plan: Blue Mesa, Gateview, Cobolla, Ben Butler, Graneros, and Cedarwood.
The figures shown on page 169 of the report by the National Park Service are totals for reservoirs included in the Maximum Gravity Diversion and the alternate plan called the Maximum Physical Development. The corresponding figures for the Initial Development and the Maximum Gravity Diversion would be proportionately less.
SYNOPSIS OF RECONNAISSANCE REPORT
ON
RECREATIONAL USE AND DEVELOPMENT
FOR THE
GUNNISON-ARKANSAS PROJECT
COLORADO
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
REGION TWO - OMAHA, NEBRASKA

Sponsored by
Source of Engineering Data
Situated in
Field Investigations
Report prepared

: U.S. Bureau of Reclamation
: U.S. Bureau of Reclamation
: Gunnison River Basin and
: September, October and December
: May 1948
Region 7 - Gunnison-Arkansas
Arkansas River Basin,
: Amsterdam, Montrose, Gunnison, Lake, Pueblo
1947
Basin.
and Huerfano Counties, Colorado
River Basin Recreation Studies -

: Montrose, Gunnison, Lake, Pueblo
: Colorado
: Region Two
: Nebraska
INTRODUCTION

A survey of the recreational potentialities of the reservoir sites of the Gunnison-Arkansas Project was undertaken in accordance with the Memorandum of Understanding between the National Park Service and the Bureau of Reclamation, entered into December 12, 1946. The memorandum includes recreation studies of the reservoir sites of the Blue-South Platte Project as well as those of the Gunnison-Arkansas Project. This report embraces only the recreational development and use of reservoirs of the Gunnison-Arkansas Project. A separate recreational reconnaissance report has been prepared for the Blue-South Platte Project.

Every reservoir site included in this report is, because of location, topography and other physical factors, considered to be interrelated to one or more other sites so far as recreation is concerned. For this reason the recreation studies have been made on a group basis.

The sites are reported on in groups as follows:

- **GROUP A** - Twin Lakes Reservoir
  - Sugar Loaf Reservoir

- **GROUP B** - Blue Mesa Reservoir
  - Gateview Reservoir
  - Caballo Reservoir
  - Taylor Park Reservoir
  - Aumont Reservoir
  - Toecanti Reservoir

- **GROUP C** - Ben Reid Reservoir
  - Graneros Reservoir
  - Cedarwood Reservoir
  - Pueblo Reservoir

The Gunnison-Arkansas Transmountain Diversion Project has been planned by the Bureau of Reclamation to provide for the collection of unallocated water from the Roaring Fork and Gunnison Rivers on the Western Slope of the Continental Divide to the Eastern Slope where it is needed for irrigation of land in the arid plains of southeastern Colorado. Although the main purpose of the project is irrigation, it will serve also for power development, flood control and sediment and debris control. The latter two purposes will be present in the Pueblo Reservoir only.

The Bureau's present plans consist of the basic proposal known as "Initial Development", with two possible future expansions to be known as the "Maximum Gravity Diversion" and the "Comprehensive Plan".

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The Initial Development includes the Fryingpan River Diversion, the Sugar Loaf Reservoir and the Twin Lakes Reservoir enlargements and the construction of the Pueblo Reservoir (capacity 400,000 acre-feet). Included are the construction of a tunnel through the Continental Divide to carry the water of the Fryingpan River to the Sugar Loaf Reservoir and the construction of canals as far as Salida, Colorado, where the water is returned to the Arkansas River to flow into the Pueblo Reservoir for irrigation.

The Maximum Gravity Diversion proposal consists of the Crystal River, Anthracite Creek and Maroon and Castle Creek Divisions; the Taylor Park Reservoir enlargement; the construction of the Almont Reservoir, of the Almont-Taylor Park-Cottonwood Tunnel, through the Continental Divide, of a tunnel from Salida to Wellington for power development, and of the Curecanti Reservoir for replacement of the water now taken from Taylor Park Reservoir for the Uncompahgre Project. Also included will be the enlargement of the then existing Pueblo Reservoir, to 800,000 acre-foot and the enlargement of the now existing Horsetooth Reservoir.

The Comprehensive Plan proposal consists of the construction of the Blue Mesa, Gateview, Cebolla, Graneros, Cedarwood and Ben Butler Reservoirs, together with canals and a pumping system from Blue Mesa to Cabin Creek, a gravity tunnel from Cabin Creek to Almont Reservoir, tunnels and canals from Texas Creek to Graneros Reservoir, a canal from Graneros Reservoir to Cedarwood Reservoir, and canals from Ben Butler Reservoir to the Arkansas River by way of the Ruedi River Valley.

The generation of electrical energy by the construction of powerplants at strategic locations will be in addition to the diversion of water for irrigation.

It is estimated by the Bureau that an average amount of 60,000 acre-feet of water per annum will be diverted by Initial Development. An additional 595,000 acre-foot will be available from the Maximum Gravity Diversion and in the Comprehensive Plan, a total of 990,000 acre-foot will be available.

The project proposal consists of water storage reservoirs, canals, tunnels, pumping plants, powerplants and power distribution lines.

Eight of the reservoir sites of this project lie in the Arkansas drainage just west of and generally along the Continental Divide in the rugged Rocky Mountains, a region which abounds in scenery of outstanding beauty. The other four sites lie in the Arkansas Basin, approximately 85 miles east of the Continental Divide in the vicinity of Pueblo beyond which stretch the eastern plains of Colorado.
SUMMARY

The Maximum Gravity Diversion and the Comprehensive Plan of the Gunnison-Arkansas Project will affect the Black Canyon of the Gunnison National Monument inasmuch as this project will regulate and divert water above the monument and interrupt the present flow of the river through the canyon. Under present plans for operation of the Comprehensive Plan, a total annual flow of 36,000 acre-feet is contemplated in the Gunnison River through the Black Canyon of the Gunnison National Monument. This would amount to an average flow of fifty second-foot. This proposed annual flow is not only much less than the present average streamflow of the Gunnison River through the monument area, but it is also considerably less than recorded figures showing average minimum flows through the monument. It is therefore, concluded that the Maximum Gravity Diversion and Comprehensive Plan of the Gunnison-Arkansas Project will have an adverse effect on the scenic and geological values of the national monument area.

The reservoir sites offer existing or potential recreational resources of local and State significance. While they will not serve as objectives for large numbers of people living outside the State of Colorado, they may provide pleasant stopover points for some tourists who pass through the region. They may also prove attractive to some nonresidents of the State who have summer homes or who otherwise spend their summers in the cooler mountainous localities where the sites are located.

The values created in addition to those already existing are undoubtedly of importance to the State of Colorado and the communities in the neighborhood of the sites, as well as to those persons who depend upon the tourist and resort trade for a livelihood.

That inundation will alter, even destroy the existing recreational uses and facilities at some of these reservoir sites cannot be denied. This indicates that every advantage should be taken of the recreational opportunities created by the construction of the reservoirs to assure that the recreational benefits derived will be as great if not greater than those destroyed.
RECOMMENDATIONS

A. Sufficient lands should be acquired for recreational development, where such developments are justified, at the same time the Bureau of Reclamation acquires land for other reservoir purposes. On reservoir sites where recreational developments do not appear justified, at this time, it is deemed advisable to set aside sufficient lands to allow public access to the entire shore line to the extent compatible with primary reservoir purposes. This will foster control of the reservoir shores and assure access to the pool from any point, if and when the need arises.

An important consideration is the fact that any recreational values created by construction of these reservoirs, are the result of the expenditures of Federal funds. Consequently, every effort should be made to provide for the most benefit to the public, and to assure that these benefits will not be limited to a select few.

B. When clearing the reservoir sites, due consideration should be given the method of cutting trees and the removal of dangerous rock outcroppings so as to permit the safe launching, operation and landing of boats.

C. On lands acquired at each site, the grazing of stock should be regulated by the agency responsible for the administration of the area in such a manner as to protect the area from overgrazing and to eliminate the danger of water pollution from that source.

D. The Bureau of Reclamation should give due consideration to the recreational and scenic values of all sites when locating and constructing permanent town sites, construction camps, access roads, borrow pits, waste or spoil areas, powerlines and the relocation of highways etcetera, in order not to destroy existing values.

To the extent its resources permit, the National Park Service will be interested in reviewing and commenting upon location plans for any permanent or temporary construction or relocation project required on Bureau of Reclamation lands adjacent to the shores of reservoir sites, prior to construction.

E. If and when the project is authorized, it is recommended that the Bureau consider entering into agreements at an appropriate time with the United States Forest Service relative to the development and administration of recreational facilities for reservoirs that are wholly or substantially within the boundaries of national forests. When recreational developments are recommended for sites not within or closely related to national forests, exploration should be made of the possibilities of interesting a competent state, county or local agency in assuming the responsibility for permanent areas at the appropriate time.
F. The National Park Service should be advised of any changes in present plans for construction or operation of the proposed reservoirs.

G. Although the archeological resources of the Gunnison-Arkansas Project cannot yet be definitely assessed, important data have already been discovered showing a long use of the region by both historic and prehistoric Indian tribes. It is recommended that the archeological surveys be continued by the Smithsonian Institution or a cooperating institution, and that every effort be made to salvage, through excavation, adequate samples of the important remains threatened by the formation of the reservoirs. At the same time, surveys for paleontological values which have not yet been made should be initiated and these surveys will be requested from the Smithsonian Institution and its co-operators.

Historical values to be affected by the several reservoirs in the project appear to demand further investigation, and it is recommended that a qualified historian be assigned to the project to obtain detailed information necessary to complete the survey and recordings of historical values to be obliterated by the reservoirs and related works.

H. Black Canyon of the Gunnison National Monument

A study of streamflows of the Gunnison River through the National Monument in relation to water-use proposals of the Gunnison-Arkansas Project is underway by the National Park Service. The studies have not reached the point, however, where fully considered opinions can be given regarding the various effects which the proposed diversion will have on the National Monument. Consequently, recommendations cannot yet be made as to minimum flows of the Gunnison River that should be allowed to pass through it.

I. A brief summary of the adaptability of the proposed sites to recreational development under present plans of operation, follows:
**ADAPTABILITY OF PROPOSED SITES to RECREATION DEVELOPMENT under PRESENT PROPOSED PLAN OF PROJECT OPERATION**

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<thead>
<tr>
<th>Name of Unit</th>
<th>Development</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GROUP A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin Lakes Reservoir</td>
<td>*</td>
<td>Of major importance in this group and most adaptable to water recreation. Will serve for day, weekend and vacation uses.</td>
</tr>
<tr>
<td>Sugar Loaf Reservoir</td>
<td>*</td>
<td>Of slightly less importance in this group. Will serve day, weekend and vacation uses.</td>
</tr>
<tr>
<td><strong>GROUP B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Mesa Reservoir</td>
<td>*</td>
<td>Of considerable importance in this group. Adaptable to day, overnight and weekend uses.</td>
</tr>
<tr>
<td>Gateview Reservoir</td>
<td>*</td>
<td>Less adaptable than Blue Mesa for water recreation, but will serve for day, overnight and weekend uses.</td>
</tr>
<tr>
<td>Cebolla Reservoir</td>
<td>*</td>
<td>Less adaptable than Blue Mesa for water recreation, but will serve for day, overnight and weekend uses.</td>
</tr>
<tr>
<td>Taylor Park Reservoir</td>
<td>* *</td>
<td>Less adaptable than Blue Mesa for water recreation, but will serve for day, overnight and weekend uses.</td>
</tr>
<tr>
<td>Almont Reservoir</td>
<td>*</td>
<td>Vertical fluctuation of pool to severe during summer season. Access only recommended.</td>
</tr>
</tbody>
</table>
### ADAPTABILITY OF PROPOSED SITES to RECREATION DEVELOPMENT under PRESENT PROPOSED PLAN OF PROJECT OPERATION (Cont.)

<table>
<thead>
<tr>
<th>Name of Unit</th>
<th>Development</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cucuranti</td>
<td>*</td>
<td>Vertical fluctuation of pool too severe during summer season. Access only recommended.</td>
</tr>
<tr>
<td>Reservoir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUP C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ben Butler</td>
<td>*</td>
<td>Of major importance in this group. Adaptable to water recreation. Will serve day use, very little overnight and week end use, if any.</td>
</tr>
<tr>
<td>Reservoir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graneros</td>
<td>*</td>
<td>Of secondary importance. Will serve same purposes as Ben Butler.</td>
</tr>
<tr>
<td>Reservoir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cedarwood</td>
<td>*</td>
<td>Vertical fluctuation of pool too severe during summer season. Access only recommended.</td>
</tr>
<tr>
<td>Reservoir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pueblo</td>
<td>*</td>
<td>Vertical fluctuation of pool too severe during summer season.</td>
</tr>
<tr>
<td>Reservoir</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** At Taylor Park development justified only if access road to area is possible without excessive construction cost.

At Pueblo minor temporary development may be advisable in the event that this reservoir is impounded and construction of the Ben Butler and Graneros Reservoirs is deferred for a number of years thereafter.
ESTIMATED RECREATIONAL BENEFIT EVALUATIONS AND DEVELOPMENT COSTS

The estimates of monetary evaluation of recreational benefits expected to accrue from the impoundment of these reservoirs and the preliminary cost estimates are of necessity very broad. They are to serve only as an index as to what can be expected if the dams are constructed and recreational facilities are provided.

A brief summary of the estimated recreational benefit evaluations and development costs follows:

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Annual use - visitors</td>
<td>107,000</td>
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<tr>
<td>Recreation development costs</td>
<td>$441,000</td>
</tr>
<tr>
<td>Annual operations costs</td>
<td>82,000</td>
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<tr>
<td>Gross annual benefits</td>
<td></td>
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<tr>
<td>Postproject</td>
<td>364,000</td>
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<tr>
<td>Preproject</td>
<td>166,000</td>
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<tr>
<td>Ratio of annual postproject</td>
<td>4.4 to 1</td>
</tr>
<tr>
<td>benefits to annual operations</td>
<td></td>
</tr>
<tr>
<td>costs</td>
<td></td>
</tr>
</tbody>
</table>

FURTHER STUDY AND PLANNING

If and when the Bureau of Reclamation is authorized to proceed with further planning and/or with construction, immediate attention to more detailed recreation studies is recommended, with particular thought given to acquisition of lands needed for recreation purposes. In order to insure the acquisition of adequate land for proper recreation development and for the protection of recreational resources, it will be advantageous if the Bureau of Reclamation will consult with the National Park Service on the final establishment of taking lines. Consideration should also be given to the location of borrow pits, powerlines, work roads, construction camps, permanent housing and highway relocation work where necessary in the light of proposed recreational developments and protecting scenic and recreation values.

If conditions arise which may necessitate altering the present scheme of reservoir operation, changes in operating plans may directly affect recreation planning, and modification of the foregoing conclusions and recommendations may be necessary.

(Stamp) George F. Ingalls
George F. Ingalls
Regional Chief of Lands
Chapter XVII.--Water compacts

WATER DIVERSION COMPACTS

The compacts having the greatest effect upon the Gunnison-Arkansas Project are the Colorado River Compact and the Upper Basin States Compact. The Colorado River Compact is included verbatim on the following pages. The Upper Basin States Compact, which is being negotiated at present, deals with the division of waters of the Colorado River among the states of Colorado, Wyoming, Utah, and New Mexico.

The waters passing the eastern boundary of Colorado are also subject to compact. No agreement has been reached, however, between the states of Colorado and Kansas upon the allocation of Arkansas River water to each of the two states. It is felt that the Colorado-Kansas Compact will not be inimical to the Gunnison-Arkansas Project.
COLORADO RIVER COMPACT

Letter from the Chairman of the Colorado River Commission, Transmitting Report of the Proceedings of the Colorado River Commission and the Compact or Agreement Entered into Between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming Respecting the Apportionment of the Waters of the Colorado River.

March 2, 1923.--Referred to the Committee on Irrigation of Arid Lands and ordered to be printed.

Department of Commerce,
Office of the Secretary,
Washington, March 2, 1923.

The Speaker of the House of Representatives
Washington, D. C.

Sir: The act of Congress of August 19, 1921 (42 Stat. L. 171), permitting a compact to be entered into between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, respecting the apportionment of the waters of the Colorado River, authorized the President of the United States to appoint a representative who should participate in the negotiations as a representative of and for the protection of the interests of the United States, and who should report to Congress the proceedings of the commission and the compact or agreement entered into. The President appointed me as the Federal representative under this act.

As directed by the act, I have the honor to report the compact and proceedings as follows:

The commission met for the first time January 26, 1922, in the city of Washington.
The following commissioners from all the interested States were present: W. S. Norvial, commissioner for Arizona; W. F. McClure, commissioner for California; Delph E. Carpenter, commissioner for Colorado; J. G. Scruggs, commissioner for Nevada; Stephen B. Davis, jr., commissioner for New Mexico; R. E. Caldwell, commissioner for Utah; Frank C. Emerson, commissioner for Wyoming.

An organization was affected by the election of myself as chairman and Clarence C. Stetson as executive secretary.

Subsequent meetings and public hearings were held in March and April, 1922, in Phoenix, Ariz.; El Centro and Los Angeles, Calif.; Salt Lake City, Utah; Grand Junction and Denver, Colo.; and Cheyenne, Wyo. A trip was also made to the proposed reservoir site at Boulder Canyon. A large amount of testimony was taken and numerous statements received from officials and parties who were interested in various ways in the development of the river.

The final meeting of the commission was held in Santa Fe, N. Mex., beginning November 9, 1922, and continuing until November 24. On the latter date an agreement was reached and the compact signed by all of the commissioners and approved by me as the representative of the United States.

The original of the compact is filed with the Secretary of State of the United States. A true copy is submitted herewith.

The Legislatures of the States of California, Nevada, New Mexico, Utah, and Wyoming have to date ratified and approved the compact. Measures for its approval are now pending before the Legislatures of Arizona and Colorado, and a bill is pending before the Congress (H. R. 13480) looking to congressional approval.

Frequently in the past just such very serious conflicts have arisen on interstate streams resulting in prolonged and expensive litigation and causing long delays in development. This compact, when approved, will be a settlement of impending interstate controversies and an adjudication of rights to the use of the water in advance of construction, thus eliminating litigation and laying the groundwork for the orderly development of a vast area of desert land, estimated at some 4,000,000 acres; the utilization of river flow now unused in the generation of hydroelectric energy, the possibilities of which are estimated at 6,000,000 horsepower; the construction of dams for the control of floods which annually threaten communities in which over 75,000 American citizens now reside, with property worth more than $100,000,000; the establishment of new homes and new communities, and the creation of a vast amount of new wealth.
The primary purpose of the compact is to make an equitable division and apportionment of the waters of the river. For this purpose the river system is divided into an upper and lower basin, following:

(1) A natural division—the two basins varying in topography and being separated by a thousand miles of deep canyon; and

(2) Economic lines—the climate, crops, and use of water being different. The lower river has immediate need of works for the control of floods, the development of power, and expansion of irrigation. It has concentrated blocks of irrigable land, while the upper basin, which is the source of water supply, will, because of its colder climate and more scattered acreage, probably be slower of development.

Due consideration is given to the needs of each basin, and there is apportioned to each seven and one-half million acre-foot annually from the flow of the river in perpetuity, and to the lower basin an additional million foot of annual flow, giving it a total of eight and one-half million acre-foot annually in perpetuity. There is thus allocated about 80 per cent of the total natural flow of the river, leaving some 4,000,000 acre-foot unapportioned. While no other waters are definitely allotted by the compact, there is nothing which prevents the States of either basin from using more water than the amount apportioned, any rights to such use being subject to the further apportionment at a later date. This feature is covered by a provision for the creation of a new commission at the end of 40 years, which will have power to make a further apportionment of the water not now dealt with. The compact provides machinery for the settlement, without litigation, of disputes which may arise between the States; it gives agriculture preference over power in the use of the water; it makes navigation subservient to other uses; and it leaves open for international settlement any claims to the use of water in the Republic of Mexico.

I do not consider it either necessary or appropriate to discuss in any detail the provisions of the compact which affect only the States that are parties to it. Conclusions as to those matters must rest with the States themselves. As the representative of the United States, I am primarily concerned with the protection of its interests, which may be summarized under the following heads:

(1) Its interest in the Colorado River as a navigable stream.

(2) Its relation with the Republic of Mexico.

(3) Its interest as proprietor of public lands and as owner of irrigation works.

(4) Its duties in relation to Indian tribes.

(5) Its interest under the Federal water power act.
THE EFFECT OF THE COMPACT UPON THE INTERESTS OF THE UNITED STATES IN THE COLORADO RIVER AS A NAVIGABLE STREAM.

The only clause of the compact specifically affecting the navigability of the Colorado River is paragraph (a) of Article IV, as follows:

(a) Inasmuch as the Colorado River has ceased to be navigable for commerce and the reservation of its waters for navigation would seriously limit the development of its basin, the use of its waters for purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes. If the Congress shall not consent to this paragraph, the other provisions of this compact shall nonetheless remain binding.

Many years ago the navigation of the Colorado River was possible and was actually carried on from the mouth of the river to points in what is now the State of Nevada. As late as 1904 there were still some boats engaged in transportation upon the lower reaches of the river. In 1901 the first large diversion from the lower stream system, that to the Imperial Valley, began, and this, with other developments in the basin, necessarily depleted the supply for navigation below that point.

In 1904 Congress passed an act (33 Stat. 224, sec. 25) authorizing the Secretary of the Interior to divert the waters of the Colorado River for the irrigation of lands now constituting the Yuma irrigation project. Under this authority there was constructed shortly thereafter what is known as the Laguna Dam, a large dam across the channel of the river a short distance above Yuma. This dam now effectually prevents any navigation of the river between points above and below.

Prior to the construction of this dam the operation of boats on the river had become unprofitable, there having been no navigation for several years. The boats then in service were old. They were purchased by the Government, used in connection with the construction of the dam, and then put out of service. While there is an occasional period of high water when navigation may be physically possible, this would continue for only a few months in ordinary years. There is no commercial navigation upon the river at present.

Gen. Lansing H. Beach, Chief of Engineers of the United States, War Department, in testifying before the commission, said:

While the lower Colorado did have some navigation on it in the seventies, there is nothing on it today to justify navigation being regarded as of foremost importance.

Later in his testimony he stated that he considered the river navigable as far as the mouth of the Gila.
These facts are the basis for the declaration in the compact that "the Colorado River has ceased to be navigable for commerce".

If navigation were to be considered as of paramount importance on this river, it would necessarily mean very serious interference with the agricultural and industrial development of the country tributary to it. Further dams across the stream must be constructed. Further water must be diverted, and a large quantity will be permanently lost to the volume of the river through evaporation, consumption, and diversion from the stream system. To render the river commercially navigable in fact requires a supply of water considerably greater in volume and more regular in flow than that now available. The basis for the recital in the compact that "the reservation of its waters for navigation would seriously limit the development of its basin" is therefore apparent.

It is estimated by the Reclamation Service that some 4,000,000 acres of land at present arid, barren, unoccupied, and practically worthless can be irrigated from the waters of this river and made fertile and productive. Such development means population, prosperous homes, and thriving cities. There are power possibilities on the river involving the creation of millions of horsepower of hydroelectric energy with which to put into operation and maintain vast industries furnishing profitable employment. The possibilities of agricultural and industrial development are so great and their ramifications so far-reaching as to dwarf any values in the use of this river for navigation. Navigation and diversion for agriculture may not proceed economically together, for one necessarily impairs the other. These are the considerations which induced the declaration that the use of water for the purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes.

It has been suggested that the approval by the Congress of the paragraph as to navigation might be considered violative of the international obligations of this country toward the Republic of Mexico. Upon this subject I call your attention to some expressions of official opinion.

Hon. Albert B. Fall, Secretary of the Interior, in a letter to Hon. Addison T. Smith, chairman of the Committee on Irrigation of Arid Lands of the House of Representatives, discussed those international features and reached the following conclusion regarding this provision:

The said paragraph (a), Article IV, of the compact would, in my opinion, be regarded as a violation of the rights of Mexico, and, to say the least, might be made the basis of a claim against the United States. I am clearly of the opinion that said paragraph should not be approved by the Congress of the United States.

Under date of December 30, 1922, Hon. Charles E. Hughes, Secretary of State, wrote Mr. Smith, in part, as follows:
I have the honor to acknowledge the receipt of your letter of December 21, 1922, transmitting a copy of the bill (H. R. 13480) granting the consent and approval of Congress to the Colorado River compact, and requesting me to furnish your committee such information and suggestions as may be proper regarding the proposed legislation.

The compact does not pertain to matters coming within the jurisdiction of this department, except in so far as the control and use of the waters of the Colorado River system may possibly affect the international relations of the Government. The fact that the Colorado River has international aspects and the possibility that questions of an international character concerning the use of the waters may arise, necessitating action by the Federal Government with respect to the distribution of the waters, appears to be recognized and adequately provided for by Article III (a) of the compact.

On December 12, 1895, Hon. Judson Harmon, Attorney General of the United States, in a letter to the Secretary of State (21 Op. Atty. Gen. 274), discussed fully the obligations of the United States toward Mexico in relation to the Rio Grande, both as to navigation and irrigation, international rights on that river being governed by the same treaties as on the Colorado. He reached the conclusion that Mexico had no legal basis, either under the treaties or under general principles of international law, for complaint against the construction of a dam on the Rio Grande within the United States, irrespective of its effect upon the navigability of the river below the boundary line or upon the irrigation of lands in that country.

Should Congress take the view opposed to the policy of proferring reclamation to navigation and desire to leave navigation as a superior use, the purpose can be accomplished by a reservation or exception in the approving legislation under the last sentence of the paragraph quoted without affecting the balance of the compact.

RELATIONS WITH THE REPUBLIC OF MEXICO, EXCLUSIVE OF NAVIGATION.

Some 200,000 acres of land in the Republic of Mexico are now irrigated by the Waters of the Colorado River, and it is understood that there are additional lands in Mexico that might be brought under irrigation.

The compact does not undertake to deal with those lands nor with any rights which may exist to the diversion of water for their benefit. It was realized that this subject was beyond the powers of the commission as defined in the various legislative acts and the act of Congress, which authorized the apportionment of waters only among the several States interested, and that the question could be properly determined only by agreement between the United States and the Republic of Mexico, through the treaty-making agencies of the Federal Government. At the same time the commission realized that it was not beyond the bounds of possibility that, as a matter of international policy, a treaty or agreement might at some time be entered into by the two nations which would establish
some valid rights to the irrigation of these Mexican lands, with a resulting obligation upon the United States to allow some quantity of water to pass the international boundary for their use, under such terms and conditions as might be agreed to. To provide for this possible future contingency, the terms of which can not now be foreseen, the compact provides (Art. III, c) for the equal distribution of this burden between the two basins in the United States. By reference to the letter of the Secretary of State, already quoted, it will be seen that he considers this provision adequate to cover the situation.

THE INTEREST OF THE UNITED STATES AS THE PROPRIETOR OF PUBLIC LANDS AND AS THE OWNER OF IRRIGATION WORKS.

A large part of the land through which the Colorado River flows, or which is adjacent or tributary to it, is public domain of which the United States is the proprietor. In the development of these lands the Government, through the Reclamation Service, has constructed several irrigation systems in connection with which large quantities of water are being taken from the river. The Salt River and the Yuma projects are examples.

Rights to the continued use and diversion of water for these projects are now vested either in the United States or in the individuals who are actually using it. In this respect the United States is in the same position as are thousands of appropriators whose diversions and use antedate the compact. An agreement entered into subsequent to the acquisition of their interests could not adversely affect them. The compact itself disclaims any intent to do so by Article VIII, which declares that--

Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this compact.

OBLIGATIONS TO INDIAN TRIBES.

Because of its duties and obligations toward Indians, the United States has a special interest in certain lands within the areas affected by probable developments on the Colorado River. A considerable area of the lands is embraced within Indian reservations. Some progress in the irrigation of these lands has already been made.

The interest of the United States in this regard is recognized and protected by Article VII of the compact, which provides that--

Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes.


Under the Federal water power act the United States provided a system for the granting of licenses for the construction of works for the development of power upon the public lands.
This act is applicable to the Colorado River and lands lying along it. There are numerous large power sites, and various applications for licenses for the use of its waters are now pending before the Federal Power Commission. The compact does not interfere in any way with the powers of the commission. The settlement of conflicting claims by the States, under the compact plan, should result in a more rapid development of the river possibilities as to power, as well as other purposes.

The Federal Power Commission, through its chairman, the Secretary of War, on December 29, 1922, addressed a letter to the chairman of the Committee on Irrigation of Arid Lands, expressing approval of the compact, as follows:

Federal Power Commission,
Washington, December 29, 1922

(Secretary of War, chairman; Secretary of the Interior; Secretary of Agriculture; O. C. Lorillard, executive secretary.)

Hon. Addison T. Smith,
Chairman Committee on Irrigation of Arid Lands,
House of Representatives.

Dear Mr. Smith: In reply to your request for information and suggestions on H. R. 13480, granting the consent and approval of Congress to the Colorado River compact, I have to inform you that practically all development on the Colorado River is suspended pending the acceptance by the interested States and the United States of some compact to apportion the waters equitably among the States.

There are several developments now under consideration which have merit and a fair chance of success, and in the interest of that region they should be permitted to proceed.

The compact quoted in H. R. 13480 is the result of many conferences and discussions; it has been agreed to by the representatives of all the interested States and offers the best, if not the only, chance of terminating an obstructive controversy. It is believed, therefore, that H. R. 13480 should receive favorable action.

Very truly yours,

John W. Weeks,
Secretary of War, Chairman.

In my opinion, the compact does not adversely affect any interest of the United States. If it is approved by the two States which have not yet acted, the consent of all the signatory States will have been given.
If the approval of all the States is obtained, I recommend that the compact be also approved by the Congress.

Faithfully yours,

Herbert Hoover,
Federal Representative on and
Chairman of the Colorado River Commission.

No. 6241.
United States of America.
Department of State.

To all to whom these presents shall come, greeting:

I certify that the document annexed is a true copy of the "Colorado River compact," signed November 24, 1922, at the city of Santa Fe, N. Mex., the original of which is on file in this department.

In testimony whereof I, Charles E. Hughes, Secretary of State, have hereunto caused the seal of the Department of State to be affixed and my name subscribed by the chief clerk of the said department, at the city of Washington, this 22d day of December, 1922.

Charles E. Hughes,
Secretary of State.

(Seal)

By Bon G. Davis,
Chief Clerk.

COLORADO RIVER COMPACT.

The States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, having resolved to enter into a compact under the Act of the Congress of the United States of America approved August 19, 1921 (42 Statutes at Large, page 171), and the Acts of the Legislatures of the said States, have through their Governors appointed as their Commissioners:

W. S. Norviol for the State of Arizona,
W. F. Iscruro for the State of California,
Dolph E. Carpenter for the State of Colorado,
J. C. Scurahan for the State of Nevada,
Stephon B. Davis, Jr., for the State of New Mexico,
R. E. Caldwell for the State of Utah,
Frank C. Emerson for the State of Wyoming,
who, after negotiations participated in by Herbert Hoover, appointed by the President as the representative of the United States of America, have agreed upon the following articles:

Article I.

The major purposes of this compact are to provide for the equitable division and apportionment of the use of the waters of the Colorado River System; to establish the relative importance of different beneficial uses of water; to promote interstate comity; to remove causes of present and future controversies; and to secure the expeditious agricultural and industrial development of the Colorado River Basin, the storage of its waters, and the protection of life and property from floods. To these ends the Colorado River Basin is divided into two Basins, and an apportionment of the use of part of the water of the Colorado River System is made to each of them with the provision that further equitable apportionments may be made.

Article II.

As used in this compact:

(a) The term "Colorado River System" means that portion of the Colorado River and its tributaries within the United States of America.

(b) The term "Colorado River Basin" means all of the drainage area of the Colorado River System and all other territory within the United States of America to which the waters of the Colorado River System shall be beneficially applied.

(c) The term "States of the Upper Division" means the States of Colorado, New Mexico, Utah, and Wyoming.

(d) The term "States of the Lower Division" means the States of Arizona, California, and Nevada.

(e) The term "Loo Forry" means a point in the main stream of the Colorado River one mile below the mouth of the Paria River.

(f) The term "Upper Basin" means 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 Loo Forry, and also all parts of said States located without the drainage area of the Colorado River System which are now or shall hereafter be beneficially served by waters diverted from the system above Loo Forry.

(g) The term "Lower Basin" means those parts of the States of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River System below Loo Forry, and also all parts of said States located without the drainage area of the
Colorado River System which are now or shall hereafter be beneficially served by waters diverted from the system below Leo Ferry.

(h) The term "domestic use" shall include the use of water for household, stock, municipal, mining, milling, industrial, and other like purposes, but shall exclude the generation of electrical power.

Article III.

(a) There is hereby apportioned from the Colorado River System in perpetuity to the Upper Basin and to the Lower Basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-foot of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

(b) In addition to the apportionment in paragraph (a), the Lower Basin is hereby given the right to increase its beneficial consumptive use of such waters by one million acre-foot per annum.

(c) If, as a matter of international equity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River System, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then the burden of such deficiency shall be equally borne by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver at Loe Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

(d) The States of the Upper Division will not cause the flow of the river at Loe Ferry to be depleted below an aggregate of 75,000,000 acre-foot for any period of ten consecutive years reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification of this compact.

(e) The States of the Upper Division shall not withhold water, and the States of the Lower Division shall not require the delivery of water which can not reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River System unapportioned by paragraphs (a), (b), and (c) may be made in the manner provided in paragraph (g) at any time after October first, 1963, if and when either Basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for a further apportionment, as provided in paragraph (f), any two signatory States, acting through their Governors, may give joint notice of such desire to the Governors of the other signatory States and to the President of the United States.
of America, and it shall be the duty of the Governors of the signatory States and of the President of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the Upper Basin and Lower Basin the beneficial use of the unappropriated water of the Colorado River System, as mentioned in paragraph (f), subject to the legislative ratification of the signatory States and the Congress of the United States of America.

Article IV.

(a) Inasmuch as the Colorado River has ceased to be navigable for commerce and the reservation of its waters for navigation would seriously limit the development of its basin, the use of its waters for purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes. If the Congress shall not consent to this paragraph, the other provisions of this compact shall nevertheless remain binding.

(b) Subject to the provisions of this compact, water of the Colorado River System may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

(c) The provisions of this article shall not apply to or interfere with the regulation and control by any State within its boundaries of the appropriation, use, and distribution of water.

Article V.

The chief official of each signatory State charged with the Administration of water rights, together with the Director of the United States Reclamation Service and the Director of the United States Geological Survey, shall cooperate, ex officio:

(a) To promote the systematic determination and coordination of the facts as to flow, appropriation, consumption and use of water in the Colorado River Basin, and the interchange of available information in such matters.

(b) To secure the ascertainment and publication of the annual flow of the Colorado River at Lee Ferry.

(c) To perform such other duties as may be assigned by mutual consent of the signatories from time to time.

Article VI.

Should any claim or controversy arise between any two or more of the signatory States (a) with respect to the waters of the Colorado River
System not covered by the terms of this compact; (b) over the meaning or performance of any of the terms of this compact; (c) as to the allocation of the burdens incident to the performance of any article of this compact or the delivery of waters as herein provided; (d) as to the construction or operation of works within the Colorado River Basin to be situated in two or more States, or to be constructed in one State for the benefit of another State; or (e) as to the diversion of water in one State for the benefit of another State; the Governors of the States affected, upon the request of one of them, shall forthwith appoint Commissioners with power to consider and adjust such claim or controversy, subject to ratification by the Legislatures of the States so affected.

Nothing herein contained shall prevent the adjustment of any such claim or controversy by any present method or by direct future legislative action of the interested States.

Article VII.

Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes.

Article VIII.

Present perfected rights to the beneficial use of waters of the Colorado River System are unimpaired by this compact. Whenever storage capacity of 5,000,000 acre-feet shall have been provided on the main Colorado River within or for the benefit of the Lower Basin, then claims of such rights, if any, by appropriators or users of water in the Lower Basin against appropriators or users of water in the Upper Basin shall attach to and be satisfied from water that may be stored not in conflict with Article III.

All other rights to beneficial use of waters of the Colorado River System shall be satisfied solely from the water apportioned to that basin in which they are situate.

Article IX.

Nothing in this compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, for the protection of any right under this compact or the enforcement of any of its provisions.

Article X.

This compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination all rights established under it shall continue unimpaired.
Article XI.

This compact shall become binding and obligatory when it shall have been approved by the Legislatures of each of the signatory States and by the Congress of the United States. Notice of approval by the Legislatures shall be given by the Governor of each signatory State to the Governors of the other signatory States and to the President of the United States, and the President of the United States is requested to give notice to the Governors of the signatory States of approval by the Congress of the United States.

In witness whereof the Commissioners have signed this compact in a single original, which shall be deposited in the archives of the Department of State of the United States of America and of which a duly certified copy shall be forwarded to the Governor of each of the signatory States.

Done at the City of Santa Fe, New Mexico, this twenty-fourth day of November, A. D. one thousand nine hundred and twenty-two.

(Signed) W. S. Norviol.
(Signed) W. F. Mcclure.
(Signed) Dolph E. Carpenter.
(Signed) J. G. Scruggs.
(Signed) R. E. Caldwell.
(Signed) Frank C. Emerson.

Approved:
(Signed) Herbert Hoover.
GUNNISON-ARKANSAS PROJECT—COLORADO

Potential Features

- Reservoir
- Tunnel
- Reservoir Canal (Power)
- Irrigation Canal
- Pumping Plant
- Hydroelectric Powerplant
- Substation
- Transmission Line

Potential municipal water lines not included in project estimates.

Scale of Miles

EXHIBIT B

LOCATION MAP

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

GUNNISON-ARKANSAS PROJECT—COLORADO

POTENTIAL FEATURES

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