

1977

Project History of the San Juan-Chama Project (Colorado-New Mexico)

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

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PROJECT HISTORY

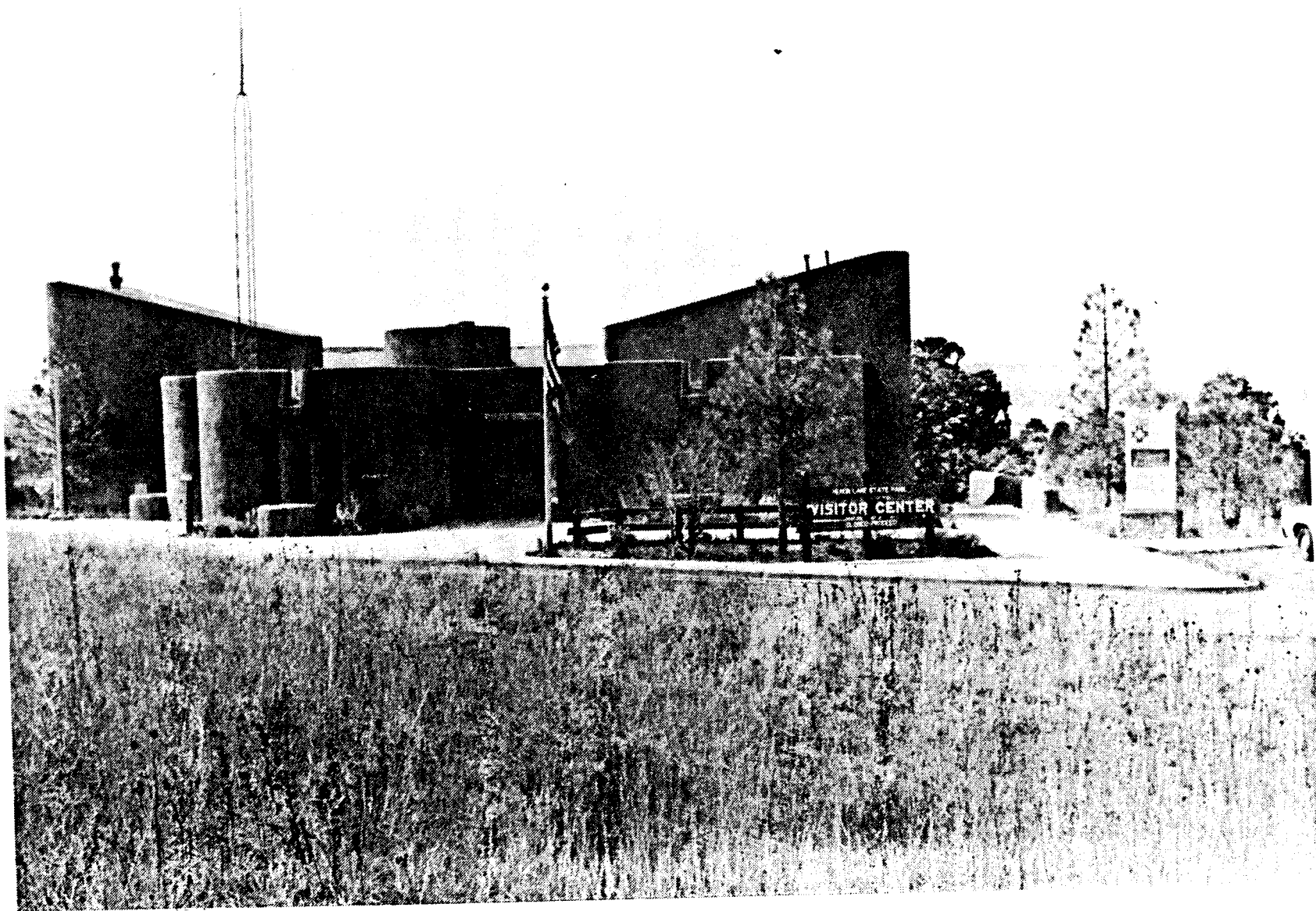
SAN JUAN-CHAMA PROJECT
COLORADO-NEW MEXICO

CALENDAR YEAR 1977
VOLUME XV

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FRONTISPIECE



CN-465-518-140 NA Upper Rio Grande Basin Projects, Colorado-New Mexico,
San Juan-Chama Project - Heron Dam Recreation Facilities. New Mexico State Park
and Recreation Division - Contractor. Front view of Visitor's Center at Heron
Reservoir.

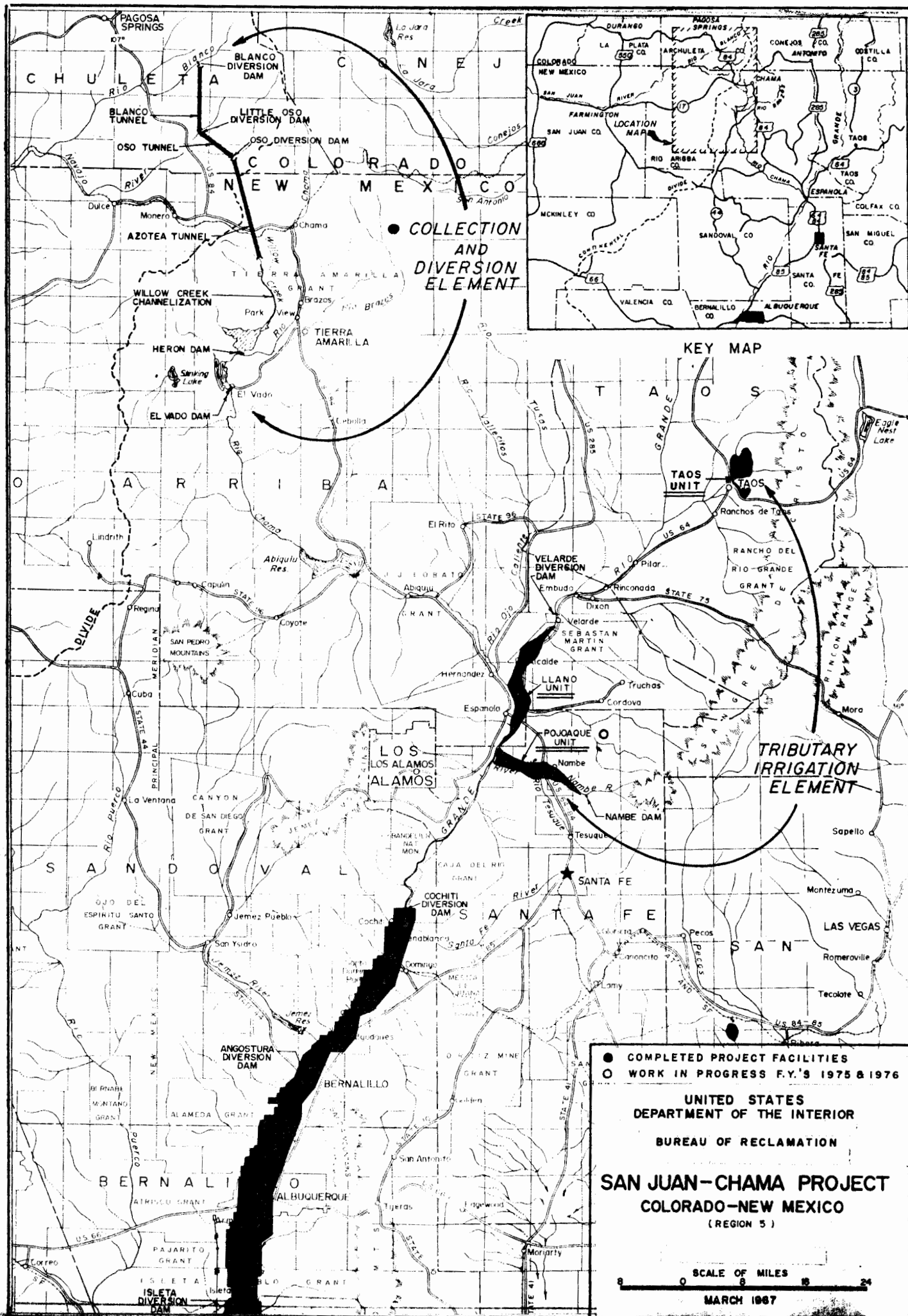
Water and Power Resources Service photo by G. Mestas 10-11-79

LIST OF PREVIOUS HISTORIES

VOLUME NO.

Calendar Year 1963
Calendar Year 1964
Calendar Year 1965
Calendar Year 1966
Calendar Year 1967
Calendar Year 1968
Calendar Year 1969
Calendar Year 1970
Calendar Year 1971
Calendar Year 1972
Calendar Year 1973
Calendar Year 1974
Calendar Year 1975
Calendar Year 1976

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XIV



General Description of the Project

The initial stage of the San Juan-Chama Project was authorized as a participating project of the Colorado River Storage Project by Public Law 87-483, June 13, 1962. The principal purposes were to furnish water supplies for the Cerro, Taos, Llano, and Pojoaque tributary irrigation units in the Rio Grande Basin north of Santa Fe, New Mexico; for supplemental irrigation for the Middle Rio Grande Conservancy District; for municipal, domestic, and industrial uses in the city of Albuquerque; and for recreation and fish and wildlife benefits.

The collection and diversion element of the project is located in south-central Colorado in Archuleta County and in north-central New Mexico in Rio Arriba County. Facilities include three diversion dams, two siphons, three tunnels, improved stream channels, and a reservoir for storage and regulation. The location and purpose of each feature has been reported in full detail in previous project histories.

To date, of the tributary units, only the Pojoaque Tributary Unit has been built. The Bureau of Reclamation proposes no action toward the development of the Cerro Unit and the ground water pumping portion of the Taos Unit. The potential development of the Indian Camp System of the Taos Unit is awaiting definitive local action. The New Mexico Interstate Stream Commission has recommended that 13,080 acre-feet of the water supply allocation intended annually for the Cerro Unit and the ground water pumping part of the Taos Unit be reallocated for municipal and industrial (M&I) use. Because of local opposition, all activity in the Llano Unit was terminated in February 1976.

The Pojoaque Unit, located about 16 miles north of the city of Santa Fe, New Mexico, provides supplemental irrigation water to 2,768 acres of irrigable land in the Pojoaque Valley Irrigation District and the Indian Pueblos of Nambe, Pojoaque, and San Ildefonso. The principal features included in the unit plan are the Nambe Falls Dam and Reservoir and appurtenant facilities located on Nambe Creek above the Nambe Falls. The topography of the reservoir area necessitated the unusual combination of a concrete thrust block used to support the left abutment of a concrete arch and the right abutment of an earth embankment. The concrete thin arch section of the dam rises 140 feet above the riverbed and measures 320 feet long at the crest. The thrust block is pyramidal in shape, 280 foot long, 105 feet high, with a maximum width of 78.5 feet. The zoned earth embankment has a maximum height of 109 feet and a crest length of 673 feet. A 110 feet uncontrolled, overflow spillway is located in the central portion of the arch dam. The spillway was designed for a discharge of 22,500 cubic feet per second with the reservoir at the maximum water surface elevation. Flat jacks were incorporated into the thin arch section and then pressurized to prestress the structure and overcome excessive tensile stresses which might develop under certain loading conditions.

Public Law 88-293, March 26, 1974, authorized the Secretary of Interior to make available for a permanent pool of 1,200 surface acres for fish and wildlife and recreation purposes at Cochiti Reservoir. Initial filling of the pool began November 1973 and was completed October 1975. Sufficient water has been subsequently provided annually to offset evaporation.

Public Law 93-493, October 27, 1974, authorized the establishment of a minimum recreation pool of 50,000 acre-feet in Elephant Butte Reservoir. Initial filling of the pool began in December 1975 and was completed in January 1976.

Additional water for a period of ten years is provided to replace loss by evaporation and other causes, not to exceed 6,000 acre-feet replacement per year.

Details of project operation essential to accounting for diverted San Juan and Rio Grande flows were developed through the joint efforts of the Rio Grande Compact Commission, the Upper Colorado River Commission, the States of Colorado, New Mexico, and Texas, and various project entities. Specific information on gaging stations' measurements and the overall operations essential to accounting for depleted San Juan and Rio Grande flows is presented in the report "Accounting of Water, San Juan-Chama Project, Colorado-New Mexico" (1963).

The problem of compliance with the Rio Grande Compact resolves itself into assessing the effect operation of the San Juan-Chama Project has on the Otowi Index Supply used to determine New Mexico's obligation to deliver water under the Rio Grande Compact.

SECTION I

PROJECT HIGHLIGHTS

Chronology of Events

The following are important dates and events in the further development and operation and maintenance of the project during calendar year 1977.

- | | |
|-------------|--|
| January 1 | All Pojoaque Unit works except recreational facilities were transferred to Pojoaque Valley Irrigation District. The development period required to adjust the economy of the area to full utilization of Tributary Unit water began at the same time. |
| January 7 | Regional Director's memorandum issuing notice of bypass amounts to be observed at Little Oso Diversion Dam. |
| January 10 | Contract for 1,200 acre-feet of San Juan-Chama Project water negotiated with Energy Research & Development Administration (Department of Energy). |
| January 12 | Issued Supplement No. 2 to final pay voucher in the amount of \$18,233.50 to G.M. Shupe, Inc., to provide payment for Order for Change (OFC) No. 4 under Specifications No. DC-7054. |
| January | Heron Dam, Piezometer Tip No. 9 reading dropped to zero. Reported on L-23. |
| February 1 | Part of the right-of-way required for construction of Blanco Diversion Dam and Blanco Tunnel was returned to Willard March through the La Plata Abstract and Title Co. |
| February 5 | Moved Nambe Falls Dam core samples from Nambe to Chama - 71 boxes. |
| February 14 | The Southwest Regional Office was informed to issue notice to the New Mexico Interstate Stream Commission that surplus water is available in Heron Reservoir in 1977 to supply 2,000 acre-feet for temporary water; contract (R.O. 100275) Letter Of Notice from Southwest Regional Office issued February 24. |
| February | Recorder stations and parshall flumes, Pojoaque Tributary Unit cleaned and ready for service (18 units using E-cell recording devices). |
| February | Payment of \$9,794.28 was made to the State of New Mexico Parks and Recreation Commission on Contract No. 6-07-82-X0594 for construction of recreation facilities at Heron Lake State Park. |
| February | Agreement made with the New Mexico State Parks and Recreation Commission, providing Soil & Moisture funds to landscape Heron's visitor center. |
| March 16 | Incident occurred where Nambe Indians locked access to Nambe Falls Dam - no monitoring could be performed and loss of two man-days. Incident suggests possible future problems with access to Nambe Falls Dam. |

March 24 The Rio Grande Compact Commission at their 38th Annual Meeting held in Santa Fe, New Mexico approved the report on accounting procedures for the Pojoaque Tributary Unit.

March Completed painting of metal work inside Heron Dam.

March Computer terminal installed at Albuquerque Office and programming began on San Juan-Chama Project water accounting.

March Payment of \$10,271.09 was made to State of New Mexico Parks and Recreation Commission on Contract No. 6-07-82-X0594.

April 12 Mr. Lyn Carpenter and Marlin Cash of the E&R Center began work to seal 3 flat jacks which had fallen to zero pressure at Nambe Falls Dam. Job completed April 14.

April 13 Inspection of Nambe Falls Dam, prior to its initial filling, by W.A. Wahler and Associates.

April 22 Issued Part 2 of the Order for Change (OFC) No. 1 in the amount of \$56,545.00 to G.M. Shupe, Inc., under Specifications No. DC-7054.

April, 29 First irrigation release from Nambe Falls Reservoir storage for 1977 season.

April Payment of \$15,730.79 was made to the State of New Mexico Parks and Recreation Commission on Contract No. 6-07-82-X0594, recreation facilities at Heron.

April Heron Dam Piezometer No. 23, previously considered abandoned or broken, began registering a reading during April.

May 12 Directive received from Regional Director to obtain water samples from all seeps and springs below Nambe Falls Dam and forward to Denver, Code 1523 for analysis.

May 17 Contractor, K&K Drilling, moved in to begin drilling of observation wells, Nambe Falls Dam. Representative of Southwest Regional Office with assistance from Albuquerque Office inspecting.

May 19 Contract for 400 acre-feet of San Juan-Chama Project water negotiated with village of Los Lunas.

May 31 Water samples were collected from seeps and springs below Nambe Falls Dam. Samples from inaccessible areas were obtained by scaling down canyon walls using safety rope.

May Payment of \$16,553.09 was made to the State of New Mexico Parks and Recreation Commission on Contract No. 6-07-82-X0594 for recreation facilities at Heron Lake.

May Payment of \$7,230.00 was made to K&K Drilling Co. Inc., for drilling of observation wells, Nambe Falls Dam, under Specification 51-C0928.

June 3 Albuquerque Office began testing and calibration of all E-cell installations and training of Pojoaque Valley Irrigation District personnel on calibration, completed in June.

June 13 Change Order No. 1 issued for well drilling at Nambe Falls Dam by K&K Drilling Co. Inc., Contract 51-C0928.

July 1 Change Order No. 2 and Voucher No. 3, Contract 51-C0928 signed by K&K Drilling Co. Inc.

July 1 Low-flow conditions declared on Rio Chama. Conditions required close coordination and operation of reservoirs for San Juan-Chama Project water with New Mexico State Engineers Office.

July 13 Problems developed with installation of piezometers P-2 and P-3 at Nambe Falls Dam. E&R Center required an additional piezometer be installed nearby. Denison sampler used on drilling and samples sent to E&R Center for analysis. New Piezometer numbered D-102.

July 19 Regional photographer at Nambe Falls Dam photographing entire canyon wall areas.

July 20 Issued Supplement No. 3 to final voucher in the amount of \$33,550.00 to G.M. Shupe, Inc., to provide payment for Part 1 of Order for Change (OFC) No. 5 under Specification No. DC-7054.

July 22 Samples from borrow area, Zone 2 embankment, and downstream of toe of earth embankment obtained for analysis by E&R Center, Supervised by E&R Center staff.

July 22 Tests were made on Piezometers P-2B, P-3, and D-102B as prescribed by E&R Center. Results faxographed to E&R Center July 25.

July 29 Drilling work completed by K&K Drilling, Nambe Falls Dam, Contract 51-C0928.

August 12 Installation of Domenquez-Escalante trail marker at Heron Visitor Center.

August 15 Further tests were conducted at Nambe Falls Dam on piezometers P-2, P-3, D-101, and D-102, requested by E&R Center.

August 16 Regional Review of Maintenance of Azotea and Willow Creek Channelization, tunnels, diversion dams and Heron Dam.

August 22 Regional Director executed approval of specifications for earthwork and plans for La Laja boatramp at Heron, State Parks & Recreation Commission given go-ahead this date.

August 24 Proof of completion of well at Heron Dam submitted and accepted by New Mexico State Engineer, File No. RG-21841. Extension of time on proof of beneficial use was also granted this date to June 1, 1978.

August 25	Dedication of Visitors Center and turn over to New Mexico State Parks & Recreation Commission. The Commission also dedicated Heron Lake State Park at a ceremony held at the visitor center. Speakers were, Governor Jerry Apodaca and Assistant Regional Director, Dale Raitt.
August	Heron Dam piezometer No. 24, previously considered abandoned or broken, began registering a reading during August.
August	Construction of residence and maintenance building at Heron was started.
September 16	Approval received for construction of Recreation Managers residence at Heron by Southwest Regional Office with modifications.
September 23	Contract 7-07-51-C0977, Nambe Falls Recreation Facilities and Access Road, awarded to F&P Construction Company of Albuquerque, New Mexico under a Section 8(a) minority business subcontract with the Small Business Administration.
October	Began work on wooden stairway to collimation stations at Nambe Falls Dam.
November 3	Notice to proceed issued on Nambe Falls Recreation Facilities to F&P Construction Company, Contract No. 7-07-51-C0977.
November 17	Judgment reached in Schutz vs. Stamm. Findings generally favorable to defendants.
December 9	Inquiry to E&R Center to determine if one regulating gate and the jet-flow gate could be used simultaneously at El Vado for low-flows. Approval received for this operation December 13.
December 14	Work began on Nambe Falls Recreation Facilities and access road.
December 19	Plaintiffs appealed Schutz vs. Stamm to Tenth Circuit Court of Appeals.
December	Seepage through left abutment of Heron Dam noticed during settlement and deflection survey. Report stated seepage too slow to measure and so slow, that it freezes at night.

SECTION II

ADMINISTRATION

Organization

Project activities and administrative support were under the supervision of the Projects Superintendent, Upper Rio Grande Basin Projects Office, Albuquerque, New Mexico. Operation and maintenance activities were handled by the Chama Field Division, Chama, New Mexico, with water accounting and storage release requirements handled by the Water Operations Division, Albuquerque, New Mexico. Engineering and construction activities were performed by the Engineering Division, Albuquerque, New Mexico.

Safety

Government forces worked 31,612 hours without a disabling injury and drove 129,603 miles with one vehicle accident at Nambe Falls Damsite, between a leased GSA vehicle and a Bureau-owned vehicle.

K&K Drilling Inc., contractor for Nambe Falls Observation Wells, worked 1,692 hours without injury; F&P Construction Company, contractor for Nambe Falls Recreation Facilities, worked 152 hours without injury.

Litigation

A judgment was reached on Civil Action No. 74-M-318, Schutz et al., vs. Stamm, et al., on November 17, 1977. It was found that two separate and distinct duties were placed upon the Secretary of Interior by P.L. 87-483:

- (1) Facilities be operated without injury, impairment, or depletion of existing or future beneficial uses of water within the State of Colorado. No evidence was found of failure to deliver water to downstream users, but there was evidence of injury as a result of sluicing operations.
- (2) Avoid depletion of flows of the Rio Navajo and Rio Blanco below the values on Page D2-7 of the November 1955 report at the diversion points. Congress did not direct the Secretary to preserve fish and aquatic life in these rivers.

Litigation involving claims on construction of Nambe Falls Dam by prime contractor G.M. Shupe, is being handled at the Denver level and no final settlement was made during 1977.

Relations with Water Users

General

In June the Bureau attended a New Mexico Interstate Stream Commission meeting to participate in discussions for feasibility studies of all-Indian irrigation development on the San Juan Pueblo in lieu of the Llano Unit. Representatives of the community ditches in the Velarde Espanola area were also in attendance to request a study of improvements to their existing ditches and extension of irrigation service to additional lands under those ditches, as an alternative to the original Llano Unit plan.

The Commission passed a motion supporting such studies by the Bureau of Reclamation so long as substantial local support was demonstrated. Nothing further

was heard during the year from the community ditch representatives in the Velarde-Espanola area.

As an outgrowth of previous requests by the San Juan Pueblo Council for an all-Indian irrigation development, consultation with the Bureau of Indian Affairs (BIA) was initiated in June to determine possible scheduling, costs and sources of funding for such a study. By the end of the year a draft of Memorandum of Understanding between BIA and Reclamation for conducting a feasibility investigation for an all-Indian project on the Pueblo, utilizing San Juan-Chama Project water, had been received from the BIA's Albuquerque Area Office and forwarded to the Southwest Regional Office for further processing. The Memorandum stipulated that Reclamation shall conduct the necessary studies and report preparation, along with associated environmental assessments, and the BIA shall provide funds and other assistance to Reclamation. Funding to be advanced would be for Fiscal Year 1978, 1979, and 1980.

The Mayor of Taos, in January 1977, requested technical assistance by the Bureau of Reclamation in determining expected costs for alternative means of developing the 400 acre-feet of M&I water which had been recommended for allocation by the Interstate Stream Commission in October 1975. One of these alternatives involved utilization of the proposed Indian Camp System and another was a well system west of the city. Some preliminary cost estimates were subsequently furnished to provide some sort of guidance to the city officials in determining their future course of action.

In December, Corps of Engineers representatives from the Albuquerque District Office met with the Bureau to discuss the possibility of determining any possible irrigation benefits attributable to storing San Juan-Chama Project water in Abiquiu Reservoir for the Middle Rio Grande Conservancy District. The Corps representatives were advised informally that the potential for assigning any significant irrigation benefits to Abiquiu Dam and Reservoir for such a proposal was doubtful. However, it was agreed that the Corps should write a letter to the Bureau of Reclamation officially requesting the Bureau's assistance in making such a determination.

Pojoaque Unit

In October the Bureau met with the Board of Directors of the Pojoaque Valley Irrigation District to discuss the District's request to the New Mexico Interstate Stream Commission for funds to conduct a survey of their irrigation operations. The Interstate Stream Commission had requested that Reclamation consider undertaking such a study. The Bureau agreed to examine the District's study proposals and to make appropriate recommendations to the Interstate Stream Commission at the Commission's November 18 meeting.

At the November meeting, the Irrigation District requested the Interstate Stream Commission for a grant of funds (not to exceed \$40,000) to permit the District to undertake studies of needed improvements in their irrigation system or in management of the system and indicated the District's intent to ask the Bureau of Reclamation to perform the study. Reclamation agreed to do so, with the understanding that an ad-hoc policy committee be established to guide the study. It was further suggested that such a committee consist of one representative each from Reclamation, the Irrigation District, the New Mexico State Engineers Office, and the Bureau of Indian Affairs.

M&I Water Contracts

The following water supply contracts have been negotiated with municipal and industrial users; irrigation supply from the Cerro Unit and the ground water pumping portion of the Taos Unit being reallocated for these purposes:

- (1) November 23, 1976 - city and county of Santa Fe and Public Service Company of New Mexico; 5,605 acre-feet.
- (2) January 19, 1977 - U.S. Department of Energy (formerly U.S. Energy Research and Development Administration); 1,200 acre-feet. Supply needed for Los Alamos Scientific Laboratories.
- (3) May 19, 1977 - Village of Los Lunas; 400 acre-feet.

The first two contractors received their initial water supply in 1977. The third did not receive its supply until the following year.

Other Contracts

The temporary water supply contract between the United States and the New Mexico Interstate Stream Commission dated May 20, 1976, was continued. Purpose of the contract is for making San Juan-Chama water available during 1977 to irrigators along the Chama River below Abiquiu Dam.

Repayment

1977 Allocation and Repayment

The following tabulations show the current allocations of project and repayment responsibilities:

Allocation of Project Costs*

Municipal and Industrial Water	\$ 40,447,000
Irrigation	52,055,000
Fish and Wildlife (non-reimbursable)	8,492,000
Other (non-reimbursable, road relocation, Recreation, Section 208, Flood Control Act of 1962, Adjustment)	2,118,000
TOTAL	\$103,112,000

Repayment of Project Costs*

Miscellaneous Non-operating Revenues	252,222
Future Anticipated Revenues from Water Sales	9,455,778
*Amount to be repaid by City of Albuquerque	30,684,000
Amount to be repaid by Middle Rio Grande Conservancy District	3,400,000
Amount to be repaid by Tributary Irrigation Units	565,000
Amount to be repaid from Upper Colorado River Basin Fund Revenues	47,526,108
Amount to be repaid by Colorado River Development Fund for Investigation	654,892
Non-reimbursable	10,574,000
TOTAL	\$103,112,000

* Exclusive of interest, specific recreation, and specific fish and wildlife.

On October 30, 1972, the Bureau of Reclamation entered into a contract under which the Pojoaque Valley Irrigation District would repay \$185,000 of the costs of the Pojoaque Tributary Unit. The total cost for construction of the unit is estimated at \$8,692,259 with reimbursable allocation to irrigation being \$8,037,367. Of the \$8,037,367 allocated to irrigation, the non-Indian water users would repay \$185,000; \$100,000 would be assigned for ultimate repayment by Indian lands to be served by the unit; and the remainder of \$7,752,367 would be repaid to the U.S. Treasury from power revenues of the Colorado River Storage Project.

Construction & Rehabilitation

Prior to execution of the Joint Powers Agreement, New Mexico State Parks and Recreation Commission had contracted with Chambers, Campbell, Isaacson, and Chaplin, Inc., (CCIC), to plan and design a visitor center and other recreation facilities at Heron Dam and Reservoir. Willow Creek boatramp, sewage lagoon, water and power transmission system, and other recreational facilities including partial construction of the Visitor Center had been completed under the administration of the National Park Service funded by Department of Commerce under Title X.

Under the Joint Powers Agreement between the United States of America and the State of New Mexico, acting by and through the New Mexico State Parks and Recreation Commission concerning Recreation Facilities at Heron Reservoir, Agreement No. 6-07-82-X0594, executed November 30, 1976, the following work was accomplished during 1977:

- (1) Work under Agreement 6-07-82-X0594 is referred to as Phase II and includes completion of the Visitor Center and construction of the managers residence, boat service and maintenance building, and the La Laja boatramp. Work was continued on these items during 1977.
- (2) Received drawings prepared by CCIC, for the State Parks and Recreation Commission on La Laja boatramp at Heron Reservoir. Approval of drawings was made by letter from Region, dated August 19, 1979.
- (3) State Parks and Recreation Commission prepared and submitted drawings on the Recreation Manager's residence at Heron Dam. Region revised and approved the drawings and construction was accomplished by the State work force. Subsequent inspections have found numerous deviations from the plans and faulty workmanship.

The Bureau coordinated with the Nambe Pueblo and their Recreational Planning Committee, during the planning and design phases of the Nambe Falls Recreational Area basic facilities. The committee designated the location they preferred for the various units. Specifications and drawings were prepared, Specification No. 51-C0977, and construction was negotiated with the Small Business Administration and F&P Construction Co., an Albuquerque contractor. (Award was made on September 23, 1977 and notice to proceed was given November 3, 1977). Construction began late in the year on the 77 picnic tables and grill units, 2 single-dual and one double-dual pit toilets, bus parking area, and approximately 2,000 feet of one lane, one-way gravel access road; all concentrated mainly on the eastside of the reservoir. A water well was drilled by Thompson Drilling of El Rancho, New Mexico for the recreational area to a depth of 165 feet and no water was found. This site was abandoned August 22, 1977. The regional geologist was contacted to find a new location to drill for water. A location above the spring to the east of the reservoir was chosen and approved by the Pueblo.

In the wake of the failure of Teton Dam, the Department of Interior engaged W.A. Wahler & Associates to carry out studies of seven recently completed dams whose reservoirs were being filled for the first time. Nambe Falls Dam was one of these studied, with the initial visit on April 13, 1977. As result of the study, nine observation wells were installed along the downstream toe of the earthfill section, 16 piezometers were installed in eight wells located in the

impervious core and downstream shell of the earthfill dam, and additional stability analyses were made. K&K Drilling Company of Montrose, Colorado, contracted to drill the wells and install the piezometers, Contract No. 7-07-51-C0928. Several of the piezometer wells have two or three piezometer tubes to various elevations. Dennison split-tube samples were taken on three of the eight piezometer wells. On July 19, 1977, samples of the embankment and downstream toe material were taken for testing. Drawing No. 465-518-4, "Nambe Falls Dam, Observation and Piezometer Wells, Plan, Details, and Sections" is included in the appendix hereto.

Section III

PROJECT ACTIVITIES

OPERATION AND MAINTENANCE

Normal operation and maintenance of the diversion and storage facilities continued throughout the year.

There were no major operational problems at the diversion dams and there appeared to be no major damage to the invert of any of the tunnels from rocks going through the tunnels.

Diversion Dams

Due to the extreme drought conditions, the District Engineer for Colorado Water Resources Department requested on behalf of downstream landowners that water be added to the Little Navajo River. This request was granted when the District Engineer agreed that bypasses at either Oso or Blanco Diversion Dams could be reduced by the amount added to the Little Navajo River. Diversion on the Little Navajo River was also discontinued in April at the request of the District Engineer, due to the drought conditions.

During 1977, Blanco and Oso Diversion Dams were operated from April until the middle of October when operations were discontinued because of low water conditions on the Rio Blanco and Navajo Rivers. Operations were not resumed until the next spring because of low water conditions. To avoid icing problems on the gates, all water was passed over the ogee weirs during the winter months.

Bypass requirements on each of the three rivers were met on a monthly acre-foot basis with a debit-credit balance accumulated daily, as outlined by previous water accounting procedures.

The parshall flumes at the diversion dams have not been rated and probably will not be as total flow into New Mexico is recorded at the Azotea Tunnel Outlet. However, the flows are recorded at each diversion and still appear to be reasonably accurate. The amounts shown as diverted at each diversion are shown below:

Blanco Diversion Dam	14,040 acre-feet
Little Oso Diversion Dam	40 acre-feet
Oso Diversion Dam	<u>4,170 acre-feet</u>
TOTAL	18,250 acre-feet

The measured flow at the outlet end of Azotea Tunnel was 19,390 acre-feet. This represents a difference of approximately 5.9% for the year.

As a result of the judgment concerning Civil Action No. 74-M-318, Schutz, et al., vs. Stamm, et al., the following actions were taken concerning operation of the diversion dams.

The Regional Director, by memorandum dated January 7, 1977, issued notice that the bypass amounts at Little Oso Diversion Dam would be 4 cubic feet per second during the months of October through April and 1,600 acre-feet per month (27 cubic feet per second mean daily average) from May through September if these amounts are available from natural flows. A 5 percent allowance for accuracy of measurement should be applied to these values.

Operation of Blanco Diversion Dam continued to limit the operation of the sluice gate to passing inflow or bypass requirements and not operated for any sluicing per se. Operation of the sluice gate to remove debris caught in the gate is allowed when necessary but is limited to raising the gate the minimum amount required to dislodge the trapped material at the gate and then immediately resetting the gate to automatic operation; this operation normally requires only 10 to 15 minutes.

The Southwest Regional Office in August 1977 proposed a modified operation to be used for 1978 at Blanco Diversion Dam. The purpose is to reduce sediment problems at the inlet of the diversion and mitigate the adverse affect of the no-sluicing criteria.

The proposal is to operate so that approximately 20 percent of the total streamflow or bypass requirements, which ever is greater, could be bypassed. A study was completed in October 1977 to determine the effect on total diversions to the project. Results of the study indicate that up to 3 percent or 3,300 acre-feet of the 110,000 acre-foot average annual diversions could be lost, based on theoretical circumstances. Further analysis, however, led to the conclusion that actual effect would be less, probably between one and two percent.

Azotea and Willow Creek Channelization

Minor degradation continued to occur at the upper end of the channel causing sediment and shale to pile up in the curves of the channel.

Some of the drainage inlets to the channel had to be repaired due to heavy inflow from local rain storms.

Riprap was shot from both quarries to provide materials for future maintenance of the channel.

Pojoaque Unit

The Pojoaque Valley Irrigation District took over operation and maintenance of Nambe Falls Dam with personnel from the Upper Rio Grande Basin Projects Office continuing to monitor instrumentation in and around the dam.

Storage in Nambe Falls Reservoir continued throughout the year and reached a maximum elevation of 6809.35 with a content of 1,174 acre-feet. The Pojoaque Valley Irrigation District made releases as required for irrigation purposes.

The dam was inspected for safety by Wahler and Associates in April, who recommended soil samples be obtained from the dam and borrow areas and that observation and piezometer wells be installed in the earth embankment and at the toe of the embankment. These recommendations were carried out and completed during the summer.

Some of the flat jacks were repressurized in April with sealant consisting of a mixture of Prestone antifreeze and bentonite. Bureau personnel continued to perform weekly monitoring of the collimation points, strain meters, flat jack pressure readings, etc.

WATER ACCOUNTING

A detailed report of San Juan-Chama Project water is submitted to the Engineers Advisors to the Rio Grande Compact Commissioners during February of each year for the preceding calendar year. A copy of the detailed accounting report as submitted in February 1978 for the year 1977, is included in the Appendix. Accounting highlights follow.

Heron Reservoir Operation

Diversions from the San Juan Basin was much less than any other year since the project began operation and less than the minimum expected from the Definite Plan Report diversion operation studies for planning of the project. The total amount of San Juan Basin water entering New Mexico, as gaged at the Azotea Tunnel Outlet, was 19,390 acre-feet.

The full allocations to the Middle Rio Grande Conservancy District, 20,900 acre-feet, and the portion of the city of Albuquerque's supply not reserved for future use, 17,700 acre-feet were released. Releases were made for evaporation losses at Elephant Butte and Cochiti Reservoirs of 6,322 and 4,149 acre-feet respectively. Releases totaling 895 acre-feet were made during the year to compensate for water stored behind Nambe Falls Dam. Releases of 35 acre-feet were also made for the Chama diverters.

The Metropolitan Water Board, composed of the city and county of Santa Fe and the Public Service Company of New Mexico, administered the contract with the Bureau for 5,605 acre-feet of water, of which 1,167 acre-feet was passed through El Vado Dam and the remaining 4,438 acre-feet was stored in El Vado Reservoir.

The Department of Energy's (DOE) 1,200 acre-feet was stored in El Vado Reservoir.

The city of Albuquerque sold a portion of its supply to the following entities for the listed amounts: county of Bernalillo, 10 acre-feet; Oxbow Area, 39 acre-feet; Four Hills, 8 acre-feet; Rayco, 8 acre-feet; University Apartments, 20 acre-feet; Burns Construction, 15 acre-feet; and DOE, 500 acre-feet. The water was passed through El Vado Dam with the exception of DOE's amount, which was stored in El Vado Reservoir. The Middle Rio Grande Conservancy District borrowed 17,100 acre-feet from the city of Albuquerque's San Juan-Chama water stored in Heron Reservoir. At the end of 1977 the storage in Heron Reservoir was 113,690 acre-feet.

In addition, the Middle Rio Grande Conservancy District borrowed from the city of Albuquerque's San Juan-Chama water stored in El Vado and Abiquiu Reservoirs in the amounts of 19,854 acre-feet and 3,230 acre-feet respectively, bringing the total San Juan-Chama Project water borrowed by the Middle Rio Grande Conservancy District from the city of Albuquerque in 1977 to 40,184 acre-feet.

The total contracted or authorized water (exclusive of Elephant Butte Reservoir) from Heron Reservoir is now 82,335 acre-feet of the estimated supply of 101,800 acre-feet or 80.9 percent.

The method used in determining the natural flow at Heron Dam during 1977 was the procedure presented in the "Water Accounting and Operation Plan," dated March 18, 1974. The recommended natural flow at the dam for 1977 is 3,390 acre-feet.

Releases were not made from Heron Dam during the winter months when a drawdown could present hazardous conditions to ice fishermen and snowmobilers.

Changes in Heron Reservoir during the year amounted to a loss of 46,250 acre-feet in storage and 15.28 feet in elevation. Releases of natural water from Heron Reservoir were made on a daily basis. Releases, other than Rio Grande water, were made for six contracts, for requirements for Elephant Butte and Cochiti permanent pools, and for Pojoaque Tributary Unit. (See Table 6 "Storage and River Regulation," in the Appendix).

Releases for the various agencies who had agreements with the city of Albuquerque were requested by the New Mexico State Engineers Office and releases for the Rio Chama diverters were requested by the New Mexico Interstate Stream Commission.

Nambe Falls Reservoir

Storage of water behind Nambe Falls Dam was continuous throughout the year except when irrigation releases exceeded the inflow. Releases on a weekly basis from Heron Dam started in March to compensate for losses to the Rio Grande. Return flow credits of 216 acre-feet were made for irrigation releases made from Nambe Falls Reservoir.

PHOTOGRAPHS

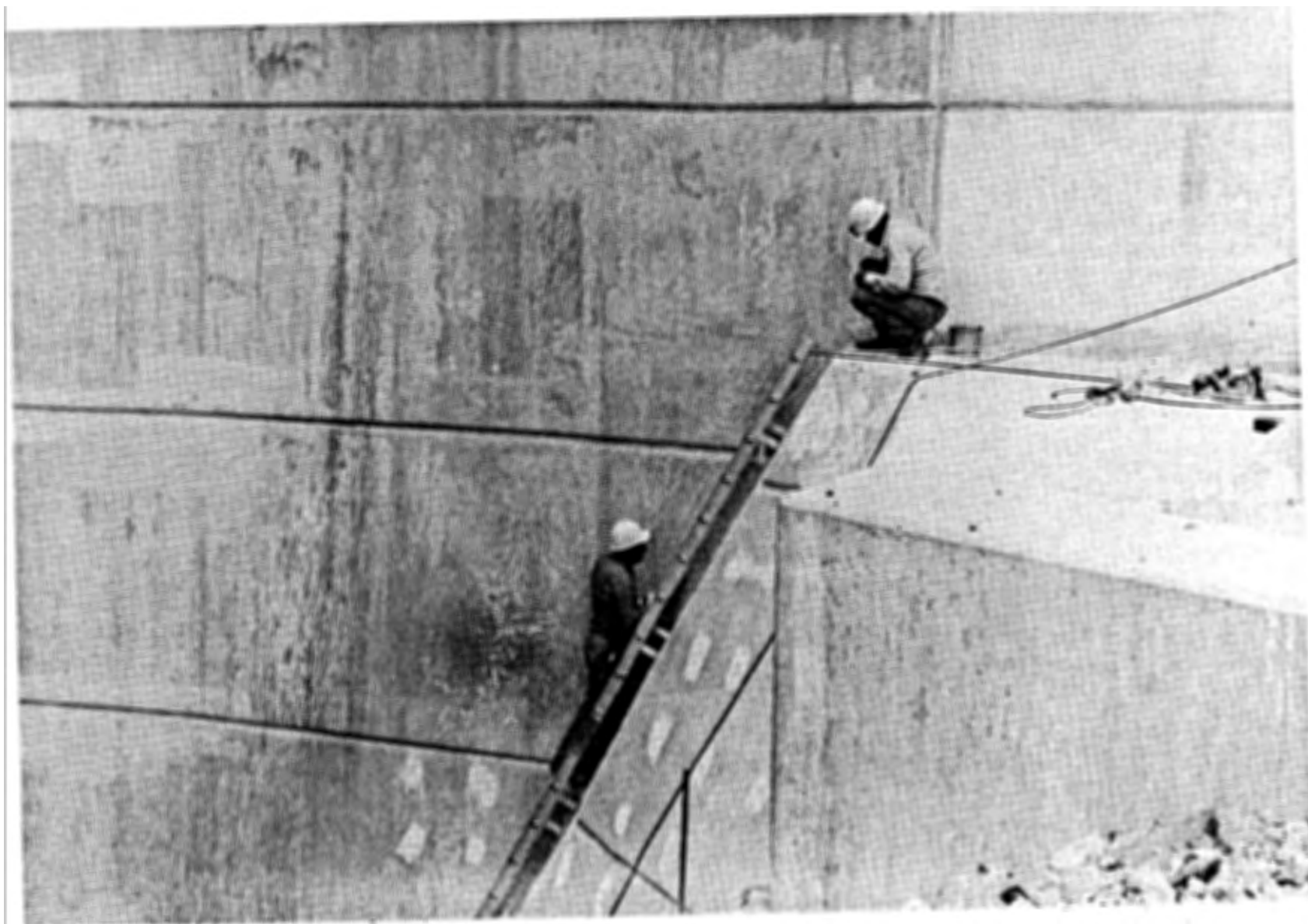
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CN-465-518-1	- Pojoaque Tributary Unit - Reclamation employees installing safety ladder at Nambe Falls Dam	21
P-465-518-95	- Pojoaque Tributary Unit - Contractor for beginning excavation for recreational picnic table at Nambe Falls Reservoir Recreational Area	22
P-465-518-94	- Pojoaque Tributary Unit - Road linking picnic sites within Recreational Area at Nambe Falls Reservoir	23
(Unnumbered)	- Heron Dam Recreational Facilities -- Manager's residence built by New Mexico State Park and Recreation Division and funded by the government	



CN-465-518-4 NA San Juan-Chama Project - Pojoaque Tributary Unit-Nambe Falls Dam. Southwest regional employees Carrol Newcomb and Shirley J. Shadix processing Denison soil sample from observation well DH-D101. Water and Power Resources Service photo by G. Mestas 6-27-77



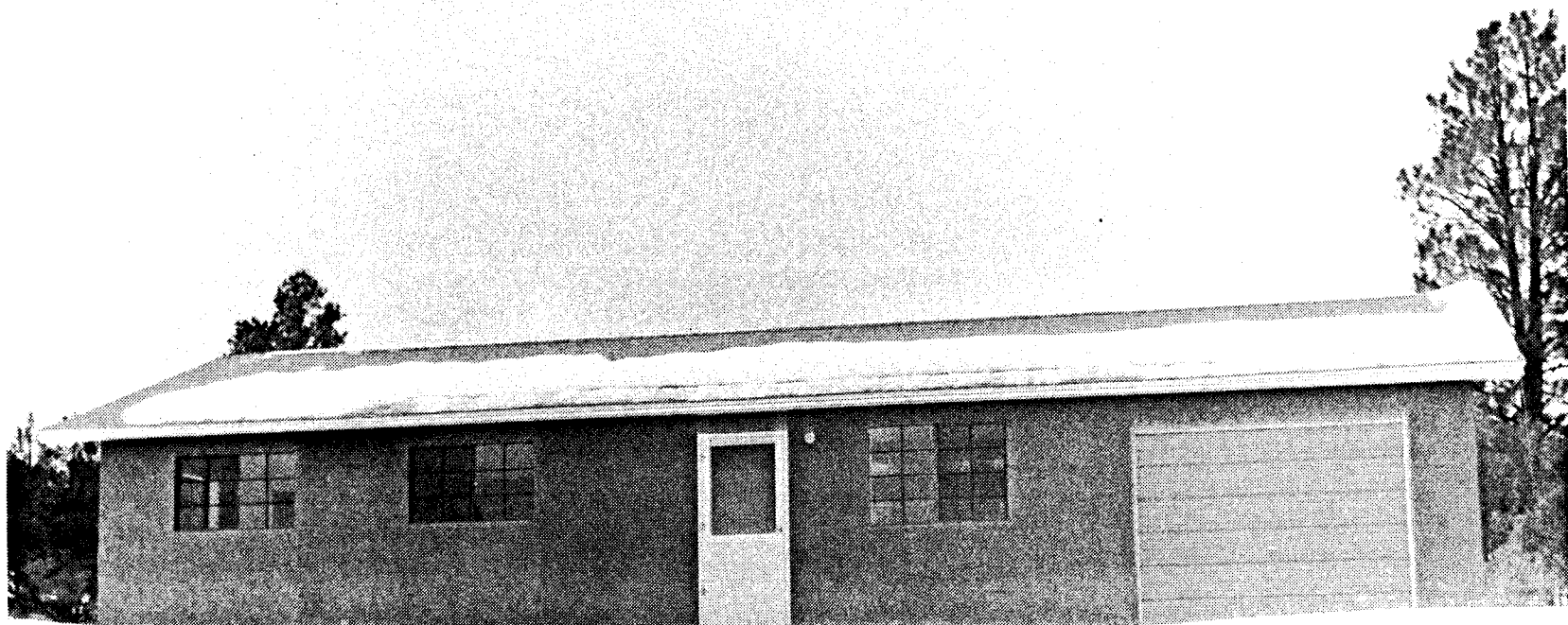
CN-465-518-1 NA San Juan-Chama Project - Pojoaque Tributary Unit-Nambe Falls Dam. Chama Field Office employees, Isidoro Manzanares and Joe Galvin installing aluminum safety ladders for safe descent to bottom of dam. Water and Power Resources Service photo by G. Mestas 6-27-77



P-465-518-95 NA Upper Rio Grande Basin Projects, San Juan-Chama Project, Colorado-New Mexico. Nambe Falls Recreation Facilities and Access Road. Bobcat with backhoe being used to dig holes for picnic table base. SBA contractor, F&P Construction Co. - Subcontractor. Water and Power Resources Service photo by G. Mestas 12-23-77



P-465-518-94 NA Upper Rio Grande Basin Projects, San Juan-Chama Project, Colorado-New Mexico. Nambe Falls Recreation Facilities and Access Road. Looking West toward Pl #12. Clearing and preliminary grading of access road has been done.
Water and Power Resources Service photo by G. Mestas 12-23-77



Manager's Residence at Heron Lake State Park. Front View.
Water and Power Resources Service photo by E. C. Hudson 2-6-78

APPENDIX

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I

PROJECT DATA

Historical Data

- 1933 Bunker survey was initial study of features that would be involved in a transmountain diversion.
- 1936 Surveys were resumed as part of the Rio Grande joint investigations sponsored and coordinated by the National Resources Committee.
- 1946 Colorado River Basin report issued by Bureau of Reclamation established the quantity of 300,000 acre-feet of water available for the transmountain diversion during negotiations of the Upper Colorado River Compact.
- Jan. 1950 Secretary of the Interior appointed the San Juan River Technical Committee to make comparative studies and report on various combination of projects to utilize San Juan River Waters within New Mexico's allotment under the Upper Colorado River Compact.
- May 1950 Special report on the San Juan-Chama Project prepared for use of the Technical Committee summarizing available data on three sizes of diversion: namely, 295,000 acre-feet, 274,000 acre-feet, and 178,000 acre-feet. Later studies, using revised allowances established the divertible amount to be approximately 235,000 acre-feet annually.
- March 1952 The Technical Committee issued a progress report which presented estimates of costs and returns of diversions of 264,000, 235,000, and 163,000 acre-feet, respectively.
- April 1952 Interim report on the San Juan-Chama Project completed. The project involved the diversion of 235,000 acre-feet of San Juan River waters into the Rio Grande Basin and full utilization of the imported waters to supplement present irrigation and municipal and industrial water supplies and to generate hydro-electric power at favorable sites in the Rio Chama Basin.
- Dec. 1953 The interim report was modified. It indicated that, under the proposed plan, all the Project costs, including annual operation, maintenance, replacement and interest could be financed with project revenues.
- April 1958 The coordinated report on the San Juan-Chama Project and the Navajo Indian Irrigation Project issued by the Commissioners of Reclamation and Indian Affairs in accordance with requirement of the proposed legislation introduced in the Senate during the 83rd Congress to authorize construction of the Colorado River Storage Project and participating projects.
- June 13, 1962 The President approved Public Law 87-483, which authorized the Secretary of the Interior to construct, operate, and maintain the Navajo Indian Irrigation and the initial stage of the San Juan-Chama Project as participating units of the Colorado River Storage Project.

Oct. 24, 1962	The President approved Public Law 87-880, the Public Works Appropriation Bill for the fiscal year ending June 30, 1963, which included advance planning funds in the amount of \$550,000 for the initial stage of the San Juan-Chama Project.
May 1963	Volume 1 of the Definite Plan Report, covering the definite plan for the diversion and regulations element of the project was submitted to the Washington Office.
Jun. 25, 1963	Repayment contract between the Middle Rio Grande Conservancy District and the United States executed.
Jun. 25, 1963	Repayment contract between the city of Albuquerque and the United States executed.
Dec. 31, 1963	The President approved Public Law 88-257, the Public Works Appropriation Bill for the fiscal year ending June 30, 1964, which included funds in the amount of \$1,600,000 for construction of the initial stage of the San Juan-Chama Project.
Mar. 26, 1964	The President approved Public Law 88-293 which authorized the Secretary of Interior to make water available for a permanent pool for fish and wildlife and recreation purposes at Cochiti Reservoir from the San Juan-Chama unit of the Colorado River Storage Project.
Apr. 22, 1964	Contract was awarded to Gibbons and Reed Co., Boyles Bros. Drilling Co., and Dugan Graham Co., Inc., of Salt Lake City, Utah, for construction of the Azotea Tunnel and appurtenant structures, the first major construction contract on the San Juan-Chama Project.
June 1964	Volume 1 of the Definite Plan Report (Revised) covering the collection and diversion element of the project was submitted.
Aug. 10, 1964	Volume 1 of the Definite Plan Report approved.
May 11, 1965	Contract was awarded to the Colorado Constructors, Inc., and A.S. Horner Construction Co., Inc., of Denver, Colorado, for construction of the Blanco Tunnel, diversion dam and appurtenant structures.
July 6, 1965	Amendment No. 1 to the repayment contract with the City of Albuquerque was executed. The amendment reduced the repayment obligation and the water allocated to the city in accordance with Public Law 88-293.
July 22, 1965	Contract awarded to Peter Kiewitt Sons' Co., of Omaha, Nebraska, for construction of the enlarged outlet works at El Vado Dam.
Feb. 1, 1966	Contract awarded to Boyles Bros. Drilling Co., of Salt Lake City, Utah, for construction of the Oso Tunnel, diversion dams, and appurtenant structures.
May 20, 1966	The repayment contract with the city of Albuquerque, as amended, was validated by the District Court of Bernalillo County, New Mexico.

Dec. 29, 1966	The enlarged outlet works at El Vado Dam was completed.
Jan. 1, 1967	Care and operation of the enlarged outlet works at El Vado Dam transferred to the Middle Rio Grande Project, operating agent for the Middle Rio Grande Conservancy District.
Aug. 14, 1967	Contract awarded to Herren-Strong, Inc., Platteville, Colorado, for earthwork and structures for Azotea Creek channelization.
Sept. 8, 1967	Contract awarded to Universal Constructors, Inc., for construction of Heron Dam and relocation of State Highway No. 95.
Sept. 1967	Volume 2 of the Definite Plan Report covering Pojoaque and Llano Tributary Irrigation Units of the project was submitted.
May 15, 1968	Volume 2 of the Definite Plan Report approved with respect to the Pojoaque Unit.
Dec. 6, 1968	Azotea Creek channelization completed.
Jan., 30, 1969	Public hearings held in Santa Fe, New Mexico by New Mexico Interstate Stream Commission to hear proposals for the use of unallocated San Juan-Chama Project water.
Mar. 20, 1969	Contract awarded to Co-Con, Inc., Albuquerque, New Mexico for earthwork and structures for Willow Creek channelization.
May 22, 1969	Construction completed on the Blanco Tunnel, diversion dam and appurtenant structures.
Oct. 3, 1969	A petition was filed with the Santa Fe County Commissioners for the organization of the Pojoaque Valley Irrigation District.
Dec. 30, 1969	Amendatory Agreements were executed on the contracts for the construction of the Oso and Azotea Tunnels. The Oso contract was terminated as of December 10, 1969, and the remaining work transferred for completion under the Azotea contract.
Apr. 21, 1970	Election by the district water users approved formation of the Pojoaque Valley Irrigation District and chose three members for the Board of Directors.
Aug. 2, 1970	Construction of the Willow Creek channelization was completed.
Oct. 21, 1970	Storage of water initiated in Heron Reservoir.
Oct. 1970	Volume 2A of the Definite Plan Report covering the Indian Camp System of the Taos Tributary Irrigation Unit of the project was submitted.
Nov. 11, 1970	Construction completed on the Azotea Tunnel and appurtenant structures.

Dec. 29, 1970	The repayment contract with the Pojoaque Valley Irrigation District approved as to form by the Assistant Secretary of the Interior.
Feb. 15, 1971	Organization of the Oate Conservancy District was completed.
Jun. 9, 1971	Work on construction of Heron Dam, the last major feature of the San Juan-Chama Project was completed.
Aug. 9, 1971	Volume 2A of the Definite Plan Report for the Indian Camp System, Taos Unit, was approved.
Sept. 17, 1971	The repayment contract with the Oate Conservancy District was approved by the Department of the Interior.
Oct. 30, 1972	The repayment contract with the Pojoaque Valley Irrigation District was executed.
Feb. 9, 1972	The Definite Plan Report on the Llano Unit was resubmitted to Commissioner after revision.
Jul. 10, 1972	The Definite Plan Report on the Llano Unit, as revised, was approved by the Assistant Commissioner.
Aug. 24 & 25, 1972	Court hearing on formation of Rancho de Rio Grande Conservancy District was held in District Court, Taos County, Taos, New Mexico.
Jan. 23, 1973	The final environmental statement was filed for the Pojoaque Unit of the Tributary Units - San Juan-Chama Project.
Apr. 25, 1973	The Repayment Contract No. 14-06-500-2041 between the United States and the Oate Conservancy District (El Llano) was executed by the Regional Director.
May 23, 1973	The Repayment Contract No. 14-06-500-1986 for the Pojoaque Valley Irrigation District was validated by the District Court.
Sept. 4, 1973	Establishment of the El Llano Conservancy District and execution of the contract between the district and the United States was confirmed and approved by the District Court.
Sept. 21, 1973	Permanent project headquarters were established at 509 Camino de los Marquez for construction of the Nambe Falls Dam - Pojoaque Unit - San Juan-Chama Project - New Mexico.
Apr. 10, 1974	Bid opening held at Santa Fe Post Office Building - Specifications No. DC-7054, for construction of Nambe Falls Dam - Pojoaque Unit - San Juan-Chama Project - New Mexico.
Apr. 10, 1974	A complaint was filed in the U.S. District Court for the District of Colorado, Ernest W. Schutz et al., vs. Gilbert Stamm et al., Civil No. 74-318.
Jun. 13, 1974	G.M. Shupe, Inc., was awarded a contract for construction of Nambe Falls Dam, Specifications No. DC-7054.

Jul. 10, 1974 Defendants filed motions to dismiss the civil action, Ernest W. Schutz et al., vs. Gilbert Stamm et al., for lack of jurisdiction and for failure to join necessary parties.

Dec. 30, 1974 Motions to dismiss the civil action, Ernest W. Schutz et al., vs. Gilbert Stamm et al., were denied by the U.S. District Court, Denver, Colorado.

Feb. 14, 1975 Contract No. 5-07-82-S078 awarded to Jemez Mountain Electric Cooperative to provide permanent electric service to Nambe Falls Dam.

May 14, 1975 New Mexico Supreme Court disallowed formation of Rancho del Rio Grande Conservancy District on grounds that judge had erred the excluding some land from the proposed district and substituting other land in 1973 when district was formed.

October 1975 Based on ground water investigation and economical evaluations, the Bureau determined that development of the Cerro Unit and Taos Pumping Unit was not feasible.

Oct. 15, 1975 Field hearing conducted on Llano Unit by Water and Power Subcommittee of the House Interior and Insular Affairs Committee.

Oct. 8, 1975 New Mexico Interstate Stream Commission recommended that 13,080 acre-feet of water be allocated to 12 municipal and industrial users.

Nov. 5, 1975 Contract No. 500C-352(SF), clearing Nambe Falls Reservoir, awarded to Larry Brown, Contractor, Penasco, New Mexico.

Feb. 12, 1976 Contract No. 500C-365, Azotea Tunnel outlet baffle drop repair, awarded to Fisher Excavation Service, Contractor, Chama, New Mexico.

Feb. 19, 1976 Initial storage of water, Nambe Falls Reservoir.

Feb. 26, 1976 Because of strong opposition, the Bureau recommended that further activity on the Llano Unit be terminated.

Mar. 19, 1976 Contract No. 6-07-82-C0584, Nambe Falls O&M Building awarded to Seegee Engineering Company, Albuquerque, New Mexico.

Apr. 23, 1976 Agreement executed with Nambe Pueblo concerning recreation facilities at Nambe Falls Reservoir.

Jun. 24, 1976 Contract No. 6-07-82-C0633, barbed wire and chain link fence, Nambe Falls Reservoir, awarded to Larry Brown, Penasco, New Mexico (small business contract).

Jun. 28, 1976 Construction of Nambe Falls Dam completed.

Jul. 26, 1976 Notice given that construction of Pojoaque Unit works was essentially complete.

Oct. 1, 1976	San Juan-Chama construction office, Santa Fe, New Mexico, officially closed. All further responsibility transferred to Upper Rio Grande Basin Projects Office, Albuquerque, NM.
Nov. 23, 1976	Contract negotiated with city and county of Santa Fe and Public Service Company of New Mexico for 5,605 acre-feet of water.
Nov. 30, 1976	Joint Powers Agreement with State of New Mexico State Park and Recreation Commission was signed for Recreation Facilities at Heron Reservoir, Contract No. 6-07-82-X0594.
Dec. 29, 1976	Transfer of 7,973 acres of wildlife mitigation lands was completed. The lands conveyed are to provide for losses resulting from inundation by Heron Reservoir.
January 10, 1977	Contract for 1,200 acre-feet of San Juan-Chama Project water negotiated with Department of Energy.
March 24, 1977	The Rio Grande Compact Commission approved accounting procedures for the Pojoaque Tributary Unit.
April 13, 1977	Inspection of Nambe Falls Dam, prior to its initial filling, by W.A. Wahler and Associates.
May 17, 1977	Contractor, K&K Drilling, drilled observation wells at Nambe Falls Dam. Work complete on July 29, 1977.
May 19, 1977	Contract for 400 acre-feet of San Juan-Chama Project water negotiated with village of Los Lunas.
August 12, 1977	Installation of Domenquez-Escalante trail marker at Heron Visitor Center.
August 16, 1977	Regional Review of Maintenance of Azotea and Willow Creek Channelization, tunnels, diversion dams and Heron Dam.
August 22, 1977	Regional Director executed approval of specifications for earthwork and plans for La Laja boatramp at Heron, State Parks & Recreation Commission.
August 24, 1977	Proof of completion of well at Heron Dam accepted by New Mexico State Engineer.
August 25, 1977	Dedication of Visitors Center and turn over to New Mexico State Parks & Recreation Commission. The Commission also dedicated Heron Lake State Park at a ceremony held at the visitor center.
September 23, 1977	Contract 7-07-51-C0977, Nambe Falls Recreation Facilities and Access Road, awarded to F&P Construction Company of Albuquerque, New Mexico under a Section 8(a) minority business subcontract with the Small Business Administration.
November 17, 1977	Judgement reached in Schutz vs. Stamm. Findings generally favorable to defendants.

December 13, 1977

Approval to use one regulating gate and the jet-flow gate simultaneously at El Vado for low-flows.

December 14, 1977

Work began on Nambe Falls Recreation Facilities and access road.

December 19, 1977

Plaintiffs appealed Schutz vs. Stamm to Tenth Circuit Court of Appeals.

SAN JUAN-CHAMA, CRS PARTICIPATING

PROJECT DATA AS OF SEPTEMBER 30, 19 77

SCHEDULE A

GENERAL

Project Location	Colorado and Rio Grande Basins, Collection and Diversion Element located in Archuleta County, Colorado, and Rio Arriba County, New Mexico Tributary Units located in Rio Arriba, Taos, and Santa Fe Counties, New Mexico.			State	Colorado-New Mexico		
Authorization (s)	Act of June 13, 1962 (76 Stat. 96) P.L. 87-843			Congress. Dist. No.	Colo. - 3; N.Mex. - 1		
Cost of Features Originally Authorized	\$ 85,428,000 1/	Land Certification	10-7-53	Finding of Feasibility	7-3-58		
Irrigation Development, Ultimate		Full Supply	5,734	Land Certification	81,610	2/	acres
Irrigation Development, Completed		Full Supply	xxx	Supplemental Supply	84,378	2/	acres
Power Development, Installed Capacity		Ultimate	xxx	Supplemental Supply	84,378		acres
Municipal & Industrial Water, Annual Delivery Capacity		Ultimate	61,280	Completed	xxx		kW
Construction Begun 4-22-64 (award 1st First M & I Water Storage initiated First Irrigation Water		Ultimate	61,280	Completed	61,280		a.f.
contract)			October 1970	Initial Power	xxx		

SCHEDULE B

CUMULATIVE FINANCIAL DATA

Total Construction Appropriations	\$ 73,034,019 1/	Total Oper. & Maint. Appropriations	\$ 1,595,454	Total Federal Expenditures	\$ 71,591,004 3/	Cost of Plant, Prop. & Equip.	\$ 77,810,957
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SCHEDULE C

COST, ALLOCATIONS AND ULTIMATE REPAYMENTS

Cost		Allocations		Ultimate Repayments & Other Credits	
Cost to Date 9/30/77	\$ 73,487,659	Irrigation	\$ 52,055,000 4/	By Irrigators	\$ 4,090,982
Est. Cost to Complete	21,326,341	Commercial Power		By Commer. Power Revenues	47,526,108
Total Plant Cost	94,814,000	M & I Water	34,944,000 5/	By M & I Water Users	40,252,000
Corollary Cost	2,795,000	Fish & Wildlife NR	\$ 8,456,000	Other	668,910
Total Construction Cost	97,609,000	Recreation NR	772,000	Total Repayments	92,538,000
Other Charges	xxx	Flood Control	xxx	Nonreimbursable	10,574,000
Interest during Construction	5,503,000	Highway Construction (Relocation) NR	1,346,000	Other Credits	xxx
Total	103,112,000	Total Construction Cost	97,609,000	Surplus Total	103,112,000

SCHEDULE D

AMOUNTS PER IRRIGABLE ACRE

Irrigation Investment	2/	\$ 578	Payment Capacity	\$ 1.73
Repayment			Annual Charges (est.)	
By Irrigators		46	O & M	.81
By Power Revenues		527	Construction	.92
By M & I Water Users			Total	1.73
By other source -- CRDF		5		
Nonreimbursable				

SCHEDULE E REPAYMENTS TO DATE

By Repayment Contracts	\$ 731,000
By Power Revenues	
By Water Service Contracts	
Contributions	
Other	907,114 2/
Total Repayment	1,638,114

SCHEDULE F

NONREIMBURSABLE COSTS

Feature, Function or Reason	Authorizing Act	Amount
Road Relocation 6/	10-23-62	\$1,346,000
Fish and Wildlife 8/ & 9/	6-13-62	8,456,000
Recreation 10/	6-13-62	772,000

SCHEDULE G AUTHORIZED CONSTRUCTION CHARGE-OFFS

Feature, Function or Reason	Authorizing Act	Amount
xxx	xxx	xxx

SCHEDULE H

STATUS OF REPAYMENT CONTRACTS (See Remarks for Water Service Contracts)

Repayment Entity	Total Value	Contract Date	Validation Date	Matured Value
Middle Rio Grande Conservancy District	\$ 3,400,000	6-25-63	Not required	\$ 125,000
City of Albuquerque - Amended 7-6-65	30,684,000 + Int.	6-25-63	May 20, 1966	606,000
Pojoaque Valley Irrigation District	185,000	10-30-72	May 25, 1973	-
Ocate Conservancy District	380,000	4-25-73	Sept. 4, 1973	-

SCHEDULE I

AREA OF IRRIGABLE LANDS, CROP RETURNS AND O & M COSTS CROP YEAR 19 76

Irrigation Service Lands		Irrigated Acreage	Total Gross Crop Value	Aver. Crop Value Per Irrig. Acre	Actual O & M Cost per Irrigated Acre Operated by		
Full Supply	Supplemental				Bureau	Water Users	Total
xxx	xxx	xxx	\$ xxx	\$ xxx	\$ 11/	\$ xxx	\$ xxx

SCHEDULE J

PROJECT OPERATION

Division - Unit	Operating Organization	Date	Feature or Extent of Operation
xxx	Bureau of Reclamation	1974	Diversion and Storage System

- REMARKS: 1/ Excludes \$400,000 authorized for recreation facilities.
 2/ Middle Rio Grande Project; excl. 8,101 ac. of Cl 6W lands.
 3/ \$550,000 Advance Planning excluded; also excludes Section 8.
 4/ Includes \$486,892 CRDF costs.
 5/ Includes \$168,000 CRDF costs.
 6/ October 23, 1962, P.L. 874, 87th Congress (76 Stat. 1173).
 7/ Includes \$654,892 costs from CRDF.
 8/ Amendment of August 14, 1946, to the Wildlife, Fish and Game Act.
 9/ Includes not to exceed \$3,000,000 to make water available for a permanent pool for fish and wildlife and recreation purposes at Cochiti Lake, as authorized by P.L. 88-293, March 26, 1964, 88th Congress (78 Stat. 171).
 10/ P.L. 485, 84th Congress, 2nd Session, Section 8.
 11/ \$68,842 agricultural, \$158,765 M&I, \$26,785 costs credited and for recreation management funds.

SCHEDULE K

RECREATIONAL AREAS, CALENDAR YEAR 19 76

Name of Lake, Reservoir or Recreation Area	Total Area (Acres)	Water Surface Area (Acres)	Elevation	Annual Attendance	Administering Agency
Heron Reservoir	10,012	5,905	7,186	100,511	New Mexico State Park and Recreation Commission

SCHEDULE L

STORAGE RESERVOIRS

Name	River	Purpose	Capacity (acre feet)		Surface Area (acres)	Year Completed
			Active	Total		
Heron	Willow Creek	I-F&W-M&I	400,000	401,000	5,900	1971
Nambe Falls	Rio Nambe	Irrigation-F&W	2,500	2,900	2,700	1976

SCHEDULE M

STORAGE DAMS AND DIKES

Name	Reservoir	Type	Hydraulic Height (ft)	Structural Height (ft)	Crest Length (ft)	Total Volume (yd ³)	Year Completed
Heron Dike	Heron	Earth and Rockfill	---	94	2,405	3,031,000	1971
Heron Dam	Heron	Earth and Rockfill	265	275	1,220		1971
Nambe Falls	Nambe Falls	Concrete thin arch	122	140	500		1976
		Zoned earthfill embankments		109	690		

SCHEDULE N

DIVERSION DAMS

Name	River	Type	Diversion Cap. (ft ³ /s)	Hydraulic Height (ft)	Length (ft)	Total Vol. (yd ³)	Year Completed
Little Oso	Little Navajo River	Concrete ogee weir	150	15	295	7,400	1970
Blanco	Rio Blanco	Concrete ogee weir, embankment wings	520	20	200	23,360	1969
Oso	Navajo River	Concrete ogee weir, embankment wings	650	23	790	32,100	1970

SCHEDULE O

POWERPLANTS

Name	No. of Units	Capacity of Unit (kW)	Existing Plant Capacity (kW)	Ultimate Plant Capacity (kW)	Date First Generation	Year Completed
xxx	xxx	xxx	xxx	xxx	xxx	xxx

SCHEDULE P

TRANSMISSION LINES

Circuit Miles							Total Circuit Miles
Above 230 kV	230 kV	161 kV	138 kV	115 kV	110 kV	69 kV	
xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

SCHEDULE Q

SUBSTATIONS

Number of Substations in Operation	xxx	Total Capacity of Transformers	xxx	kVa
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SCHEDULE R

GENERATION AND OTHER SOURCES OF POWER ENERGY (KWH) F.Y. 19 77

Powerplant	Generation			Purchased Power	Interchanged	Total Energy Available
	Gross	Plant Use	Net			
Total	xxx	xxx	xxx	xxx	xxx	xxx

SCHEDULE S

DISPOSITION OF POWER ENERGY (KWH) F.Y. 19 77

Total Energy Available	Losses	Interchanged	Recl. Projects for Resale	Sales		
				Electric Utilities	Ultimate Consumers	Total
xxx	xxx	xxx	xxx	xxx	xxx	xxx

SCHEDULE T

SALES TO ELECTRIC UTILITIES F.Y. 19 77

Item	Municipal Utilities	State Utilities	Rural Cooperatives	Other Federal Agencies	Privately Owned Utilities	Subtotal
Energy Sales (kWh)						
Revenues (dollars)	\$ xxx	\$ xxx	\$ xxx	\$ xxx	\$ xxx	\$ xxx
Year-end Customers (number)						

REMARKS:

PHYSICAL FEATURES IN OPERATION ON RECLAMATION PROJECTS
(EXCLUSIVE OF POWER FACILITIES)

PROJECT SAN JUAN-CHAMA		REGION SW	STATE N.Mex.-Colo.
DIVISION Chama		UNIT OR IRRIGATION DISTRICT 1/	
<input checked="" type="checkbox"/> CONSTRUCTED OR REHABILITATED BY THE BUREAU		<input type="checkbox"/> CONSTRUCTED BY OTHERS	<input type="checkbox"/> CONSTRUCTED UNDER SMALL LOAN PROGRAM

FEATURES	REPORTED PREVIOUS JUNE 30 76	CHANGES DURING FY 77	TOTAL AS OF Sept. 30, 19 77
*Storage reservoirs, number	1		1
*Storage dams, number			
*Dikes, number			
*Diversion dams, number	3		3
*Pumping plant, 1,000 hp or more, number			
Pumping units, number			
Pumping plants under 1,000 hp, number			
Pumping units, number			
Carriage facilities:			
Canals: Unlined, miles			
Lined, miles			
*Total miles			
*Pipelines, miles			
*Tunnels, miles	26.6		26.6
Distribution facilities:			
Laterals: Unlined, miles			
Lined, miles			
Pipeline, miles			
Total miles			
Drains, open, miles			
Drains, closed, miles			
Other significant features:			
Azotea and Willow Creek channeliza-			
tion to convey imported water to			
Heron Reservoir, miles	0	6.4	6.4

REMARKS

1/ The facilities completed to date and in O&M status presently shown are being financed by City of Albuquerque, Middle Rio Grande Conservancy District, Pojoaque Valley Irrigation District, Energy Research and Development Administration, and Public Service Company of New Mexico, City and County of Santa Fe.

PHYSICAL FEATURES IN OPERATION ON RECLAMATION PROJECTS
(EXCLUSIVE OF POWER FACILITIES)

PROJECT SAN JUAN-CHAMA		REGION SW	STATE N.Mex.-Colo.
DIVISION Pojoaque		UNIT OR IRRIGATION DISTRICT Pojoaque Valley Irrigation District <u>2/</u>	
<input checked="" type="checkbox"/> CONSTRUCTED OR REHABILITATED BY THE BUREAU		<input type="checkbox"/> CONSTRUCTED BY OTHERS	<input type="checkbox"/> CONSTRUCTED UNDER SMALL LOAN PROGRAM

FEATURES	REPORT PREVIOUS TO 76	CHANGES DURING FY 77	TOTAL AS OF Sept. 30, 1977
*Storage reservoirs, number	1 <u>1/</u>		
*Storage dams, number	1 <u>1/</u>		
*Dikes, number			
*Diversion dams, number			
*Pumping plant, 1,000 hp or more, number			
Pumping units, number			
Pumping plants under 1,000 hp, number			
Pumping units, number			
Carriage facilities:			
Canals: Unlined, miles			
Lined, miles			
*Total miles			
*Pipelines, miles			
*Tunnels, miles			
Distribution facilities:			
Laterals: Unlined, miles			
Lined, miles			
Pipeline, miles			
Total miles			
Drains, open, miles			
Drains, closed, miles			
Other significant features:			

REMARKS

1/ Nambe Falls Reservoir storage began 3/76.

2/ Entity responsible for Operation and Maintenance, effective January 1, 1977.

II

WATER AND LAND USE

SAN JUAN-CHAMA PROJECT

POJOAQUE TRIBUTARY UNIT - WATER ACCOUNTING

I

Introduction

Water accounting procedures for the Tributary Units of the San Juan-Chama Project require that details of project operation essential to accounting of water be developed through the joint efforts of the U.S. Bureau of Reclamation, States of Colorado, New Mexico, and Texas, and the Rio Grande Compact Commission and the particular project entities. The report "Accounting of Water San Juan-Chama Project, Colorado-New Mexico," dated February 1963, set forth the general requirements of the accounting procedures. These general requirements and procedures have been accepted by the States and Federal agencies involved. The following excerpt from the report sets forth the basic concept.

"The development of project-type irrigation on the Tributary Units would result in an annual depletion of the Rio Grande flows at the Otowi gaging station if not compensated for by San Juan-Chama Project water. During the year there will be both depletions of, and accretions to, the Rio Grande flows at Otowi. In general, depletions will occur when water is being stored in the reservoirs of the Tributary Units and when diversion of natural flows are greater than the historical, non-project diversions. During periods of low flows, and during the non-irrigation season, there will be accretions resulting from additional return flows from diversions of stored water and greater diversions of natural flows. The depletions can be offset by daily, or other short-period, releases of San Juan-Chama water from Heron No. 4 Reservoir. The accretions can be used in meeting the demands of the City of Albuquerque and the Middle Rio Grande Conservancy District for San Juan-Chama water."

In essence, the future flow at Otowi will be kept equal to the pre-project flow at Otowi, plus additional San Juan-Chama water conveyed past that point for delivery to users of transmountain water such as the City of Albuquerque, Middle Rio Grande Conservancy District, the Cochiti Lake recreation pool, and, temporarily, for the Elephant Butte recreation pool. In order to assure that Rio Grande water at Otowi will not be reduced, concurrent releases of water from Heron Reservoir will be made for water stored at Nambe Falls Reservoir. The 1963 report also states:

"For the purpose of making concurrent releases to replace increased diversions of the Rio Grande water to storage in the Tributary Units, it can be assumed that the losses on such releases from Heron No. 4 Reservoir to Otowi are equal to the reduction in losses on Rio Grande water resulting from such additional diversions on the Tributary Units, and therefore, Heron No. 4 Reservoir releases will be made on the basis of an acre-foot of release for each acre-foot of additional diversion to storage."

Requirements of the accounting procedures for the Pojoaque Unit were outlined in the 1963 report as follows:

"Pojoaque Unit. The presently irrigated lands of the Pojoaque Unit will be supplied supplemental water from the Nambe Falls Reservoir. Since the unit will contain no new lands it will be assumed that there will be no increase in direct diversions of natural flow, and only accounting for storage effects, adjusted for return flow from diversions from storage will be required.

The following items will be determined for the Pojoaque Unit in carrying out the accounting procedure:

1. Inflow to Nambe Falls Reservoir.
2. Change in storage in Nambe Falls Reservoir.
3. Increased evapotranspiration losses from Nambe Falls Reservoir areas.
4. Release from Nambe Falls Reservoir.
5. Total diversions.
6. Consumptive use.
7. Return flow."

Thus, water accounting for the Pojoaque Tributary Unit consists of the following three items, which will be discussed in greater detail in the following sections:

- (a) Concurrent releases from Heron Reservoir to compensate for diversions to storage in Nambe Falls Reservoir.
- (b) Estimate of additional losses in the reservoir area resulting from project operation.
- (c) Return flow credit from irrigation water released from storage.

II

Nambe Falls Reservoir - Storage Effect

Water stored in Nambe Falls Reservoir will be physically Rio Grande water, but the reservoir will be operated as if the water therein were San Juan-Chama Project water. In order to keep the future flow at Otowi equal to the Rio Grande flows that would have occurred prior to the Unit operation, concurrent releases of an acre-foot of water from Heron Reservoir will be made for each acre-foot of water diverted to storage in Nambe Falls Reservoir.

The release of additional water into the Rio Chama will increase channel losses on the Rio Chama and the storage of water in Nambe Falls Reservoir will reduce losses on the Rio Grande below the mouth of Pojoaque River. Storage and release of water at Nambe Falls Reservoir was studied to determine the effects on losses on the Pojoaque River due to a change in pattern of flows. Since the riparian vegetation receives its supply from ground water which is near the surface of the stream bed throughout the reach, no change in consumptive use by the riparian vegetation would occur. A hypothetical storage and release sequence was applied to curves of channel water surface area versus discharge and to evaporation rates. The results showed a negligible effect on evaporative losses along the Pojoaque River. The overall consideration of channel losses for the replacement of the storage effect in Nambe Falls Reservoir requires replacement of only those losses between Heron Dam and Otowi. Beginning in 1974, it was assumed that channel losses between Heron Dam and Otowi would be 2.0 percent of the release from Heron Reservoir. This loss rate is appropriate for use in replacing the storage effect at Otowi.

There are two exceptions in regard to the timing of releases from Heron Dam. First, during the period when Heron Reservoir is normally frozen over, generally January through March, significant releases from the reservoir could create hazardous conditions to ice fishermen and snowmobiles on the reservoir. The required releases for these three months will normally be made in April. Second, since the channel capacity below Abiquiu Dam is presently constricted, only those releases of San Juan-Chama Project water will be made which will cause no infringement on the channel capacity necessary to carry the natural Rio Chama flows. A pre-release of the estimated storage effect for May, the period when the Rio Chama could generally be restricted, will also be made during April.

III

Nambe Falls Reservoir Losses

The Rio Grande Compact Commission has adopted a method for computing net loss by reservoir evaporation. The following excerpt is taken from the Report of the Rio Grande Compact Commission, Rules and Regulations section:

"The net loss by evaporation from a reservoir surface shall be taken as the difference between the actual evaporation loss and the evapo-transpiration losses which would have occurred naturally, prior to the construction of such reservoir."

The procedure is further defined in the "Memorandum of Agreement in Satisfaction of the Second Sentence of Par. (e), Sec. 8, PL 87-483," dated November 7, 1962, and signed by the Rio Grande Compact Commissioners for New Mexico and Texas. Following is an excerpt taken from the Memorandum of Agreement:

- "Appraisal of Reservoir Losses. Analysis of land culture of each new reservoir area including Abiquiu will be made and the present consumptive use of the gross reservoir area estimated. The amount of this present use in each reservoir area will be subtracted from the sum of the consumptive use on the portion of the same gross area not covered by water and the evaporation losses from the water surface in the remaining reservoir area to determine project caused depletions under project operation."

The pre-project consumptive use was assumed to have been equal to the consumptive use by 25.1 acres of riparian vegetation plus 30.9 acres of foothill vegetation. The riparian vegetation consisted of cottonwood, willow, thinleaf alder, and waterbirch, all of medium density and having considerable undergrowth. The foothill vegetation consisted of pinon pine and juniper, all of light density having sparse undergrowth.

It was concluded that the riparian vegetation received a full supply from the groundwater and the annual use was estimated to be 3.25 feet. ^{1/} The consumptive use of the remaining vegetation was estimated to be equal to the effective precipitation. Effective precipitation is that part of the total precipitation that is available for consumptive use as defined by the average of values presented in U.S. Bureau of Reclamation Manual, Volume IV, paragraph 4.1.12B.

The water surface area of the stream at average discharge within the reservoir was 1.2 acres. This openwater area of the stream was included with the area of riparian vegetation in order to simplify future computations.

^{1/} This was developed in the Regional Director's letter of December 4, 1975, entitled "San Juan-Chama Project Water Accounting, Nambe Falls Reservoir Losses, Pre-project Condition."

The actual consumptive use will be the effective precipitation on the reservoir area not covered by water plus the actual evaporation computed for the water surface area. The evaporation will be determined by multiplying the openwater area by 0.7 of the measured pan evaporation, which will be obtained from a weather station to be located in a convenient location near the upper end of the irrigated area or near the reservoir. The area of river channel above the average water surface elevation will not be considered as it is insignificant.

The additional losses in the reservoir area resulting from project operation will be actual consumptive use minus the pre-project consumptive use. This additional loss will effect Otowi during times of storage and times when the reservoir elevation is held constant and must be replaced by the San Juan-Chama Project. During times of release from reservoir storage, evaporation losses would not require additional replacement from Heron Reservoir since the evaporation would be from transmountain water previously stored and not from the natural flow of the stream.

IV

Irrigation Return Flow Credit

General. Since releases will be made from Heron Reservoir for water stored in Nambe Falls Reservoir, it will not be necessary to replace the new irrigation depletions occurring when that additional supply is released from storage and is delivered to the irrigated area. Because the replacement of the storage effect was made on an acre-foot per acre-foot basis and because some return flow, surface and ground, will return to the mainstream of the Rio Grande and result in an actual augmentation of the river at Otowi, proper accounting of this increase should be made and appropriate credit given.

Irrigation credit will almost always be less than other downstream San Juan-Chama water uses. In the immediate future, exceptions could occur during winter months when Nambe Falls Reservoir is essentially full and at the same time ice conditions dominate Cochiti Lake, or occasionally during the irrigation season when precipitation at Cochiti Lake is sufficient to largely offset net evaporation losses caused by the Cochiti permanent pool. During these rare occasions, other San Juan-Chama water uses could be sufficient to offset irrigation credit. As downstream uses of San Juan-Chama water continue to increase, occurrence and quantity of excess irrigation credit should lessen.

The following sections present the data used in estimating the amount and occurrences of the Pojoaque Unit return flow.

Total Diversion of Releases from Storage. Since the Unit will contain no new lands, it is assumed there will be no increase in direct diversions of natural flow. If it can be further assumed that the irrigation practices will be the same whether the available supply is derived from natural flow or storage releases, it will not be necessary to measure the diversions providing it can be assumed that all of the storage releases will be diverted.

A review of the measured diversions and stream flow available for 1974 and 1975 shows that total diversions during the irrigation season are generally in excess of the available flow at the upper end of the irrigation system. The only major exception is during June 1975, when a 14 day period showed diversions to be less than was the inflow at the head of the reach. Discharge during 1974 was only 64 percent of the 1935 to 1972 average, while 1975 flow was about average. Measured flow and diversions for 1974 and 1975 are shown on figures 1 and 2.

The analysis of the 1974 and 1975 diversions also shows the redirection of return flow or of natural gain. Since both the diversions and stream flows at Nambe Falls have the same pattern of variation, it would imply that the additional diversions are generally redirection of return flow. The excess diversions over inflow during 1974 and 1975 are shown in the tabulation below.

Inflow and Diversions
Pojoaque Unit
(Units in acre-feet)

<u>Period</u>	<u>Discharge Rio Nambe Gage at Nambe Falls</u>	<u>Adjusted Discharge^{1/} Rio Nambe at Head of Irrig. Area</u>	<u>Diversions</u>	<u>Apparent Divertable Gain</u>
5/74-10/74	2,619	2,650	3,701	1,051
4/75-8/75	5,592	5,659	6,115	456

^{1/} Adjusted by 1.012 times the recorded flow at Rio Nambe below Nambe Falls. This adjustment was developed by the U.S.G.S. and presented in their open-file report 74-151, "Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico, June 1975."

A review of records for the period 1936 to 1941 was made (the only other period for which records are available). The amount of inflow, diversion, and computed diversion demand was determined for the reach from the uppermost diversion, Nambe highline canal, to the former gage above Pojoaque Bridge, termed the upper reach. The results are shown in Table 1. Only one month of the 35 months resulted in diversions being less than both the inflow and the diversion demand. This implies that, when available, the diversion system is physically capable of diverting all flows required to meet the irrigation demands and indicates that all irrigation releases from storage at Nambe Falls Reservoir will be diverted.

Diversion capability and ditch capacities from the mouth to Nambe Falls were reviewed. The capacities were then compared to the maximum monthly flow that may be required to satisfy diversion demands. The design peak discharge from the outlet works of Nambe Falls reservoir is 52 ft³/s. The sum of the peak experienced diversion rates for each individual ditch during 1936-1940 was 82 ft³/s. The maximum average diversion rate over a 7 day period experienced in 1974 and 1975 was 45 ft³/s. The total of the ditch capacities exceeds 200 ft³/s. These capabilities further support that full diversion of storage releases will occur.

Depletion of Storage Release. Estimated depletion of water released from storage is based on studies using data for the period 1936 to 1941, on irrigation management practices, on soil characteristics for the area, and on future condition operation studies made during the Definite Plan Report (DPR) investigations of the Tributary Units, San Juan-Chama Project.

The future condition operation studies computed for the Pojoaque Unit during the DPR investigations were used to determine an estimate of the average depletions that would accrue to storage releases from Nambe Reservoir. The operation study was a hypothetical operation of expected operations and management for project conditions using river flows, cropping patterns, and climatic conditions for the period 1935 through 1963. The results show an average annual release from storage at Nambe Falls Reservoir of 1,392 acre-feet for irrigation. The on-site depletions connected with this release are 912 acre-feet or 66 percent of the releases from storage. The future condition study assumed a better irrigation management; thus, the computed average depletions of 66 percent could be too high. Additional analyses were desired to further establish the depletion as a percent of releases from storage. Other approaches are given in subsequent paragraphs.

An analysis of the recorded data for 1936 to 1941 was made during the DPR investigations to determine the return flow and depletions for the reach of the Pojoaque Unit above Pojoaque bridge. The results of this analysis were modified slightly to reflect return flow and depletion rates which would have occurred if all diversions in excess of the estimated diversion demand had been wasted back to the river and not counted as diversions. This resulted in an estimated return flow of 60 percent and depletions of 40 percent for the upper reach. The summary of this study is shown in Table 2.

Figures 1 and 2 show that the flow at Nambe Falls is essentially diverted in the upper reach except during the spring runoff when flows exceeded the upper reach diversion demand. Approximately two-thirds of the irrigated lands are supplied from diversions in the upper reach. In order to reflect conditions similar to periods of release from storage from Nambe Falls Reservoir, it is assumed the upper reach will divert essentially all the flows at the head of the reach and that the water supply for the lower reach will be from return flow from the upper reach. Additional depletions would then occur to this return flow by redirection in the lower reach, the reach below the former Pojoaque gage. The distribution and source of return flow, surface and ground, from the upper reach was required in order to determine the amount of return flow available for redirection in the lower reach. Review of the irrigated area shows that the field slopes

TABLE 1

Inflow, Diversions, and Diversion Demand
Rio Nambe Gage - Pojoaque Creek Gage

Units in acre-feet

<u>Year & Month</u>	<u>Rio Nambe Nr. Nambe Pueblo Plus Nambe Canal</u>	<u>Measured Diversions</u>	<u>Estimated ^{1/} Diversion Dem.</u>
1936 Apr.	968	1,002	390
May	1,670	1,535	680
June	788	1,051	1,490
July	475	683	1,160
Aug.	753	679	1,290
Sept.	615	491	390
Oct.	<u>728</u>	<u>251</u>	<u>160</u>
Total	5,997	5,692	5,560
1937 Apr.	1,480	1,290	350
May	2,270	1,633	290
June	2,080	1,425	920
July	1,040	1,201	1,600
Aug.	521	799	1,340
Sept.	544	938	480
Oct.	<u>465</u>	<u>478</u>	<u>180</u>
Total	8,400	7,764	5,160
1938 Apr.	646	1,128	350
May	1,430	1,815	870
June	987	1,255	1,190
July	656	736	1,270
Aug.	421	771	1,420
Sept.	650	689	620
Oct.	<u>656</u>	<u>474</u>	<u>130</u>
Total	5,446	6,868	5,850
1939 Apr.	1,150	1,192	280
May	1,520	2,198	980
June	735	1,154	1,570
July	355	522	1,360
Aug.	399	558	1,460
Sept.	392	541	660
Oct.	<u>400</u>	<u>632</u>	<u>130</u>
Total	4,951	6,797	6,440

TABLE 1
(Continued)

Inflow, Diversions, and Diversion Demand
Rio Nambé Gage - Pojoaque Creek Gage

Units in acre-feet

<u>Year & Month</u>	<u>Rio Nambé Nr. Nambé Pueblo Plus Nambé Canal</u>	<u>Measured Diversions</u>	<u>Estimated ^{1/} Diversion Dem.</u>
1940 Apr.	1,040	1,116	350
May	2,140	1,542	670
June	1,370	1,570	1,530
July	500	693	1,530
Aug.	447	643	1,350
Sept.	404	508	570
Oct.	<u>438</u>	<u>410</u>	<u>160</u>
Total	6,339	6,592	6,160

^{1/} The diversion demand for areas served by diversions above the former Pojoaque gage was estimated as the ratio of the irrigated acreage served by the diversions above Pojoaque bridge to the total irrigated area used in the historic operation study times the diversion demand computed for the historic conditions over the full reach developed for the DPR.

The following tabulation presents the derivation of the diversion demand.

	<u>Acre-feet per acre</u>
Crop consumptive use-----	2.07
Effective precipitation-----	<u>-0.44</u>
Crop irrigation requirement-----	1.63
Farm waste and deep percolation losses (50%)-----	<u>1.63</u>
Farm delivery demand-----	3.26
Distribution system losses (28%)-----	<u>1.27</u>
Diversion demand-----	4.53

TABLE 2

From DPR Dated August 1967
 Table A-5 Summary--historic conditions
Rio Nambé gage-Pojoaque Creek gage
Pojoaque Unit.

(Unit - acre-feet)

Period	Outflow	Inflow	Diversions	Tributary inflow	Nonbeneficial consumptive waste	Net return	Overall irrigation efficiency %
4/36-3/37	4,713	7,728	5,692	532	1,064	3,209	43.6
4/37-3/38	7,340	9,632	7,764	2,285	1,031	4,218	45.7
4/38-3/39	6,718	7,205	6,868	2,526	1,066	4,921	28.3
4/39-3/40	4,030	6,358	6,797	738	1,139	4,870	28.4
4/40-3/41	5,158	7,932	6,592	451	1,021	4,388	33.4
TOTALS	27,959	38,855	33,713	6,532	5,321	21,606	179.4
5-year average	5,592	7,771	6,743	1,307	1,064	4,321	35.9 *

*Rounded to 36.0

Modifications to Reflect Bypass of Excess Diversions

1. Excess diversions estimated at 3,600 A.F.
2. Required diversions = $33,713 - 3,600 = 30,113$
3. Revised return flow = $21,606 - 3,600 = 18,006$
4. Revised average return flow = $18,006/30,113 = 60\%$
5. Adjusted overall irrigation efficiency = 40%

vary drastically, from less than .1 percent to over three percent. The soil type, 3331, is a light colored soil with five inches of refill capacity. New Mexico State Engineer Technical Report 32, "Consumptive Use and Water Requirement in New Mexico," gives estimates of field irrigation efficiencies as well as range of surface waste and deep percolation for various soil and field slopes. The review of field slopes and soil characteristics resulted in the assumption that one-third of the return flow will be surface and two-thirds from deep percolation.

Using these characteristics for the return flow, it was estimated that 70 percent of the return flow from the upper reach would be available for redirection. Assuming that the depletion rate in the lower reach is equal to the depletion rate above, then the overall depletion of flow diverted in the upper reach would be:

Unit return from upper reach	= .60
Available for redirection = .60 x .70	= .42
Return flow not redirected = .60 x .30	= .18
Return flow of redirected waters = .60 x .42	= .25
Net return flow from diversions in upper reach = .18 + .25	= .43
Net depletions = 1.00 - .43	= .57

Since the quantities presented in Table 2 may have some redirection of return flow included, the 57 percent depletion could be slightly low. In years of short supply, the depletions may be higher and return flow less.

Another approach using measured river flow and diversions for the upper reach attempted to utilize the U.S. Geological Survey's estimates of virgin flow presented in their open file report 74-151, "Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico," dated May 1975. From this report a rough estimate of virgin flow was developed for the Pojoaque River above the former Pojoaque Creek gage for the period 1936-1941. The gaging station on Pojoaque Creek above Pojoaque bridge was maintained from March 1936 through water year 1941. Diversion records are available for 17 of the 24 canals that then diverted from the Rio Nambe, Pojoaque Creek, and the Pojoaque River system from April 1936 through 1950. These records along with estimated virgin flow provides another estimate of depletions and return flow for the upper reach.

The study was operated assuming that winter diversions wasted back to the river. The study resulted in total depletions for the upper reach of 60 percent and is shown in Table 3.

TABLE 3

Annual Summary
Return Flow Analysis Based on Estimated
Virgin Flow, Measured Flow, and Measured Diversions
(Reach from Nambé Highline Canal to Pojoaque Bridge)
1936 - 1940

Units in acre-feet

<u>Year</u>	<u>Virgin Flows</u>		<u>Measured Pojoaque Creek Above Bridge</u>	<u>Apparent Depletions (-) Or Gains (+)</u>	<u>Measured Diversions Irrig-Season</u>	<u>Apparent Return Flow</u>
	<u>Nambé Creek Nr. Nambé Pueblo</u>	<u>Pojoaque Creek Above Bridge</u>				
^{1/} 1936	6800	8422	3663	-4759	5692	933
1937	9910	12292	7661	-4634	7764	3133
1938	6820	8433	5894	-2539	6868	4329
1939	6460	7978	4238	-3740	6797	3057
1940	<u>7850</u>	<u>9719</u>	<u>5014</u>	<u>-4705</u>	<u>6592</u>	<u>1887</u>
Total	37840	46844	26470	-20374	33713	13339

^{1/}1936 partial year from April thru December.

TABLE 3
(Continued)
Monthly Summary

Years & Months	Virgin Flows		Measured Pojoaque Creek Above Bridge	Apparent Depletions (-) Or Gains (+)	Measured Diversions Irrig-Season	Apparent Return Flow
	Nambe Creek Nr. Nambe Pueblo	Pojoaque Creek Above Bridge				
1936						
Apr.	968	1201	380	-821	1002	181
May	1670	2080	585	-1495	1535	40
June	788	976	51	-925	1051	126
July	475	586	47	-539	683	144
Aug.	753	933	646	-287	679	392
Sept.	615	760	408	-352	491	139
Oct.	728	902	709	-193	251	58
Nov.	499	615	407	-208		-208
Dec.	302	369	430	+61		61
Total	6800	8422	3663	-4759	5560	933
1937						
Jan.	298	365	525	+160		160
Feb.	269	328	337	+9		9
Mar.	353	433	188	-245		-245
Apr.	1480	1841	1090	-751	1290	539
May	2270	2829	1810	-1019	1633	614
June	2080	2591	1970	-621	1425	804
July	1040	1292	294	-998	1201	203
Aug.	521	643	102	-541	799	258
Sept.	544	671	129	-542	938	396
Oct.	465	573	862	+289	478	767
Nov.	317	388	64	-324		-324
Dec.	277	338	290	+48		-48
Total	9910	12292	7661	-4631	7764	3133
1938						
Jan.	194	235	421	+186		186
Feb.	173	209	208	-1		-1
Mar.	271	331	100	-231		-231
Apr.	646	799	180	-619	1128	509
May	1436	1786	464	-1322	1815	493
June	987	1225	544	-681	1255	574
July	656	812	1160	+348	736	1084
Aug.	421	518	94	-424	771	347
Sept.	650	805	618	-187	689	502
Oct.	656	812	726	-86	474	388
Nov.	412	508	792	+284		284
Dec.	321	393	587	+194		194
Total	6820	8433	5894	-2539	6868	4329

TABLE 3 (Cont'd.)

Years & Months	Virgin Flows		Measured Pojoaque Creek Above Bridge	Apparent Depletions (-) Or Gains (+)	Measured Diversions Irrig-Season	Apparent Return Flow
	Nambe Creek Nr.	Pojoaque Creek Above Bridge				
	<u>Nambe Pueblo</u>	<u>Above Bridge</u>	<u>Above Bridge</u>	<u>Or Gains (+)</u>	<u>Irrig-Season</u>	<u>Flow</u>
1939						
Jan.	302	369	478	+109		109
Feb.	220	268	455	+187		187
Mar.	504	621	620	-1		-1
Apr.	1150	1430	1010	-420	1192	772
May	1520	1891	407	-1484	2198	714
June	735	910	200	-710	1154	444
July	355	436	370	-66	522	456
Aug.	399	491	109	-382	558	176
Sept.	392	482	158	-324	541	217
Oct.	400	492	222	-270	632	362
Nov.	265	323	34	-289		-289
Dec.	<u>218</u>	<u>265</u>	<u>175</u>	<u>-90</u>		<u>-90</u>
Total	6460	7978	4238	-3740	6797	3057
1940						
Jan.	224	271	334	+63		63
Feb.	212	258	349	+91		91
Mar.	488	602	662	+60		60
Apr.	1040	1292	420	-872	1116	244
May	2140	2667	1630	-1037	1652	615
June	1370	1704	272	-1432	1570	138
July	500	617	34	-583	693	110
Aug.	447	551	37	-514	643	129
Sept.	404	497	244	-253	508	255
Oct.	438	540	456	-84	410	326
Nov.	309	378	162	-216		-216
Dec.	<u>280</u>	<u>342</u>	<u>414</u>	<u>+72</u>		<u>+72</u>
Total	7850	9719	5014	-4705	6592	1887

Using these depletion and resulting return flow characteristics to apply for both the upper and lower reaches as discussed in the previous analysis, the net return flow is computed as follows:

Unit return from upper reach	= .40
Available for rediversion = .40 x .70	= .28
Return flow not rediverted = .40 x .30	= .12
Return flow of rediverted water = .40 x .28	= .11
Net return flow from diversions in upper reach = .11 + .12	= .23
Net depletions = 1.00 - .23	= .77

It is recognized that if in fact the upper reach depletes 60 percent of releases from reservoir storage then return flow will not be sufficient to meet diversion demands in the lower reach. Thus, release will be required in excess of the upper reach diversion demand. This portion of the release will suffer depletions only in the lower reach. The net effect would be that less than 77 percent depletions would occur to total release from reservoir storage; adjusting for this indicates net depletions would be about 74 percent.

Another consideration was a review of the irrigation depletions developed for the New Mexico State Water Plan for Santa Fe County. Total depletions for surface water irrigation, which included the crop irrigation requirement and incidental on farms, canals, and below farm losses, equals about 1.23 times the crop irrigation requirement. The Pojoaque Unit accounts for about one-third of the surface irrigation in the county. The total depletions, exclusive of river channel losses, was estimated to be 53 percent of the diversions.

In summary, there are not sufficient data available to determine a firm estimate of the amount of depletions and return flow that has occurred in the past. Various approaches were used to estimate the depletions and return flow as described in preceding paragraphs and resulted in a range for expected depletions from a high of 74 percent to a low of 53 percent of diversions. It is recognized that the estimates include some rediversion during periods of sufficient supply. However, the estimated higher depletion rates are believed characteristic of the maximum depletions that would occur during periods of release from reservoir storage. Since the high side of the estimated range would be 66-74 percent depletions for water released from reservoir storage, and since it is the Bureau's position that where a reasonable probability of depletions exist, replacement water will be provided, a factor of 70 percent depletion for water released from Nambe Falls Reservoir is recommended for use in the San Juan-Chama water accounting procedures.

A more complex system for water accounting requiring measured diversions, inflows and discharge from the project area, irrigated acreage, cropping pattern, etc., was considered. Such a system would be both laborious and costly. Because of the limited ability to measure, the sediment problems associated with diversions, and still the need to estimate irrigation efficiencies, such a system may not result in more reliable accounting of project depletions than offered by the proposed simplified procedures; thus, such a complex system is considered unjustified.

Return Flow Distribution. Project operation requires determination of the return flow pattern in order to determine the appropriate credit to be given in making delivery of San Juan-Chama water at Otowi. The total amount of increased return flow from diversion of water released from reservoir storage is the release less depletions or 30 percent net return flow past Otowi. The return flow can occur via surface waste and from ground water return through deep percolation. As previously discussed, primary factors affecting the distribution of return flow between surface return and deep percolation are soil type and field slope which resulted in the assumption that one-third of the net return flow would be from surface return and two-thirds from deep percolation return. Thus, 10 percent of release from reservoir storage would be surface return and would occur in a relatively short period following release. For the purpose of practical water accounting, surface return is assumed to occur during the first accounting period following release from Nambe Falls Reservoir.

The remaining 20 percent of the return flow resulting from deep percolation return gradually and requires a long term distribution pattern. R. E. Glover's adaptation of the Dupuit-Forsheimer idealization as modified for the Pojoaque and Llano Units by Glover was used to develop the return flow pattern from deep percolation. Curves developed by Glover are shown in figure 3. The distribution using Glover's curves was computed for 36 months following a unit of water reaching deep percolation. The return flow factors for 36 months were determined using figure 4 and resulted in accounting for 71 percent of the return flow of each unit of water. A distribution was also computed for 72 months which resulted in accounting for 82 percent of the return flow. A study was made applying a Glover's distribution to the recorded diversions and to the diversion demand patterns for the period 1936 to 1941 to ascertain the balance of carry over from one year to the next for varied conditions. The results showed that only minor difference would exist if the distribution was shortened to a 12 month period following occurrence of deep percolation. This difference in distribution is balanced over time and does not have an accumulative affect. Glover's method accounts for 52 percent of the deep percolation return in the first twelve months. The remaining 48 percent was distributed equally over the twelve months. The adjusted distribution is given in Table 4, and is recommended for use in accounting of return flow credit.

TABLE 4

Return Flow Distribution

<u>Months After Release</u>	<u>Surface Waste as % of Release</u>	<u>Deep Percolation Factor</u>	<u>Deep Percolation % of Release</u>	<u>Total Return Flow as % of Release</u>
0	0	0	0	0
1	10	.090	1.8	11.8
2	0	.128	2.6	2.6
3	0	.107	2.1	2.1
4	0	.107	2.1	2.1
5	0	.093	1.9	1.9
6	0	.079	1.6	1.6
7	0	.077	1.5	1.5
8	0	.073	1.5	1.5
9	0	.065	1.3	1.3
10	0	.063	1.2	1.2
11	0	.061	1.2	1.2
12	0	.058	1.2	1.2
Total	10	1.000	20.0	30.0

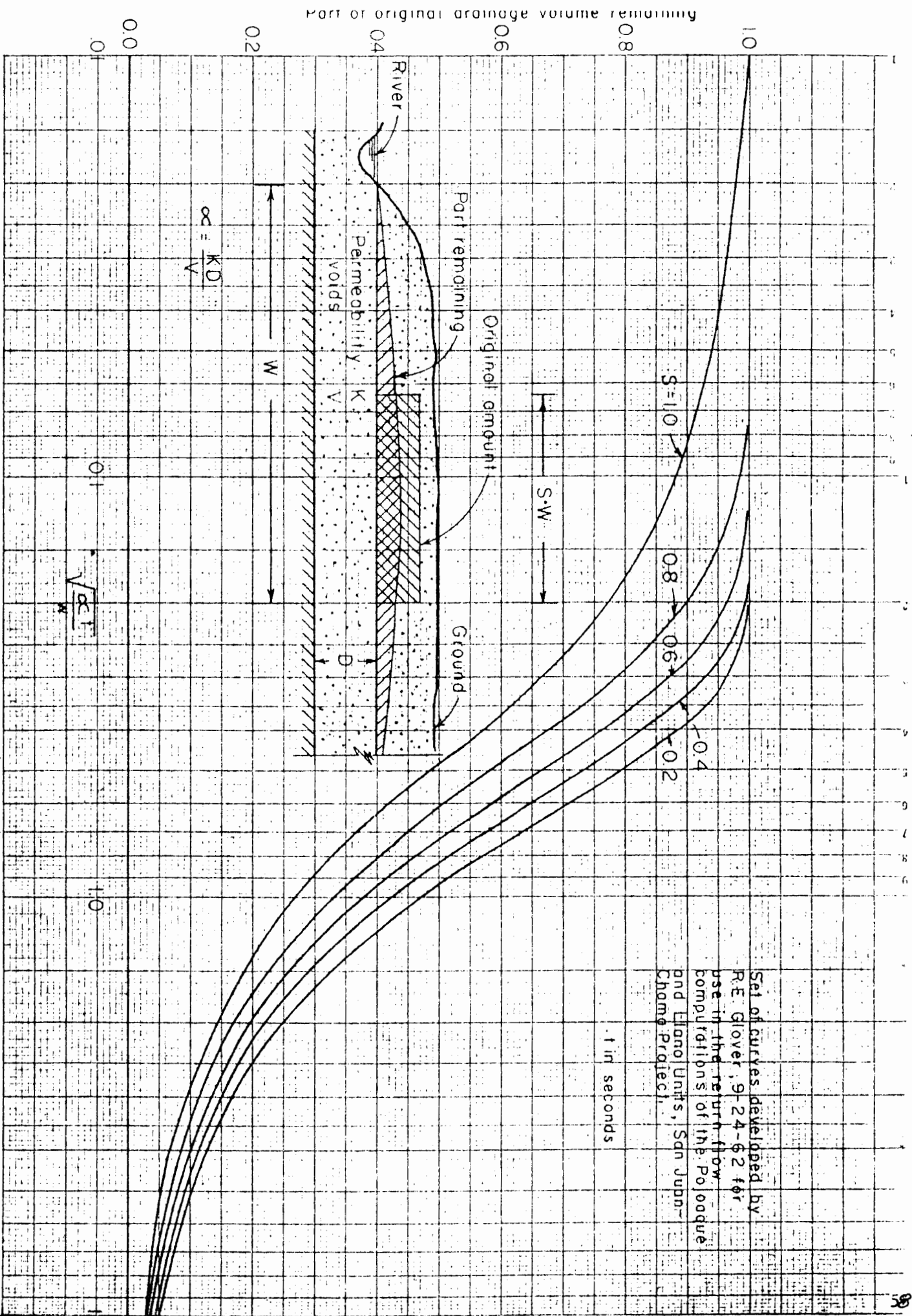


Figure 3

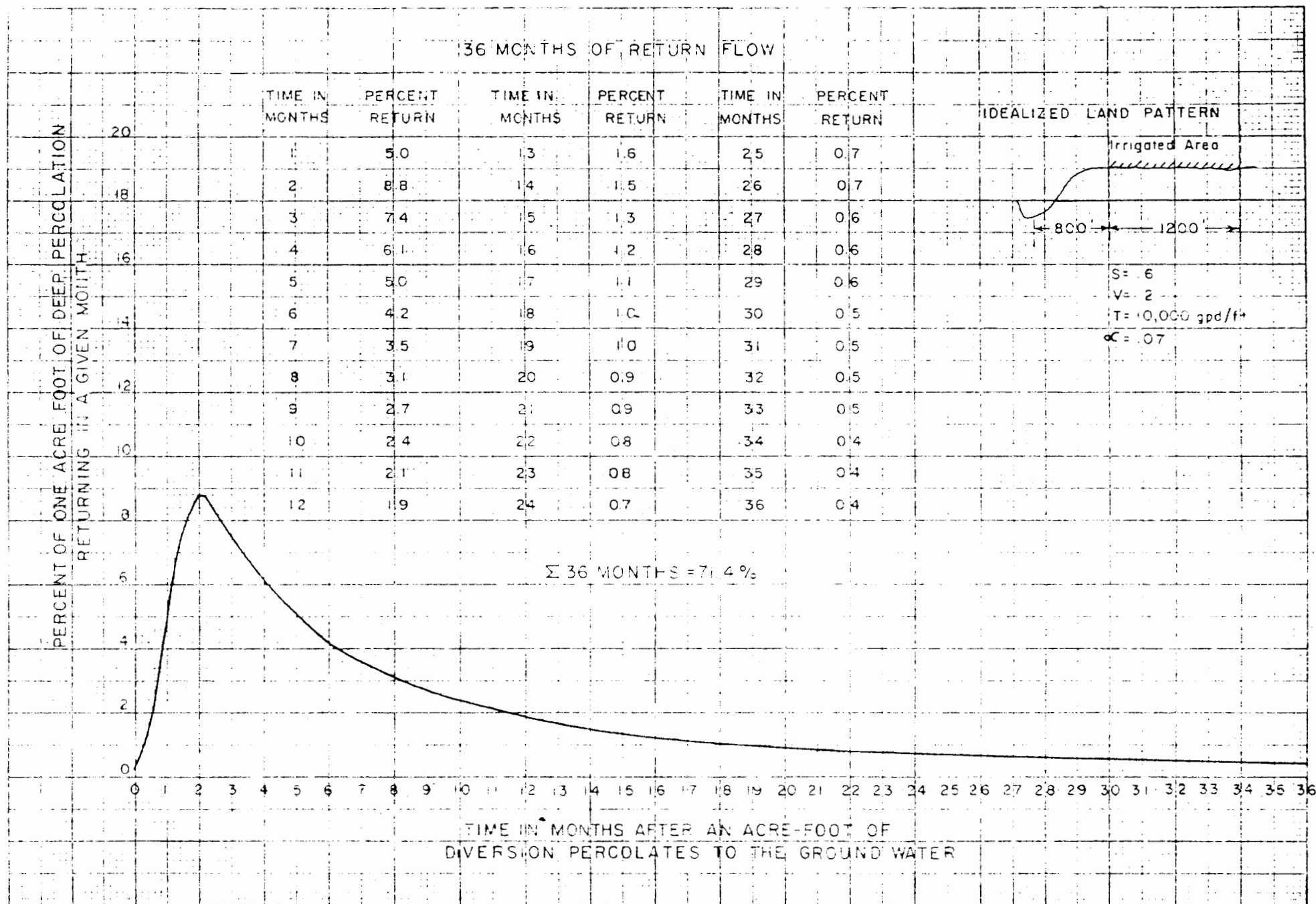


FIGURE 4

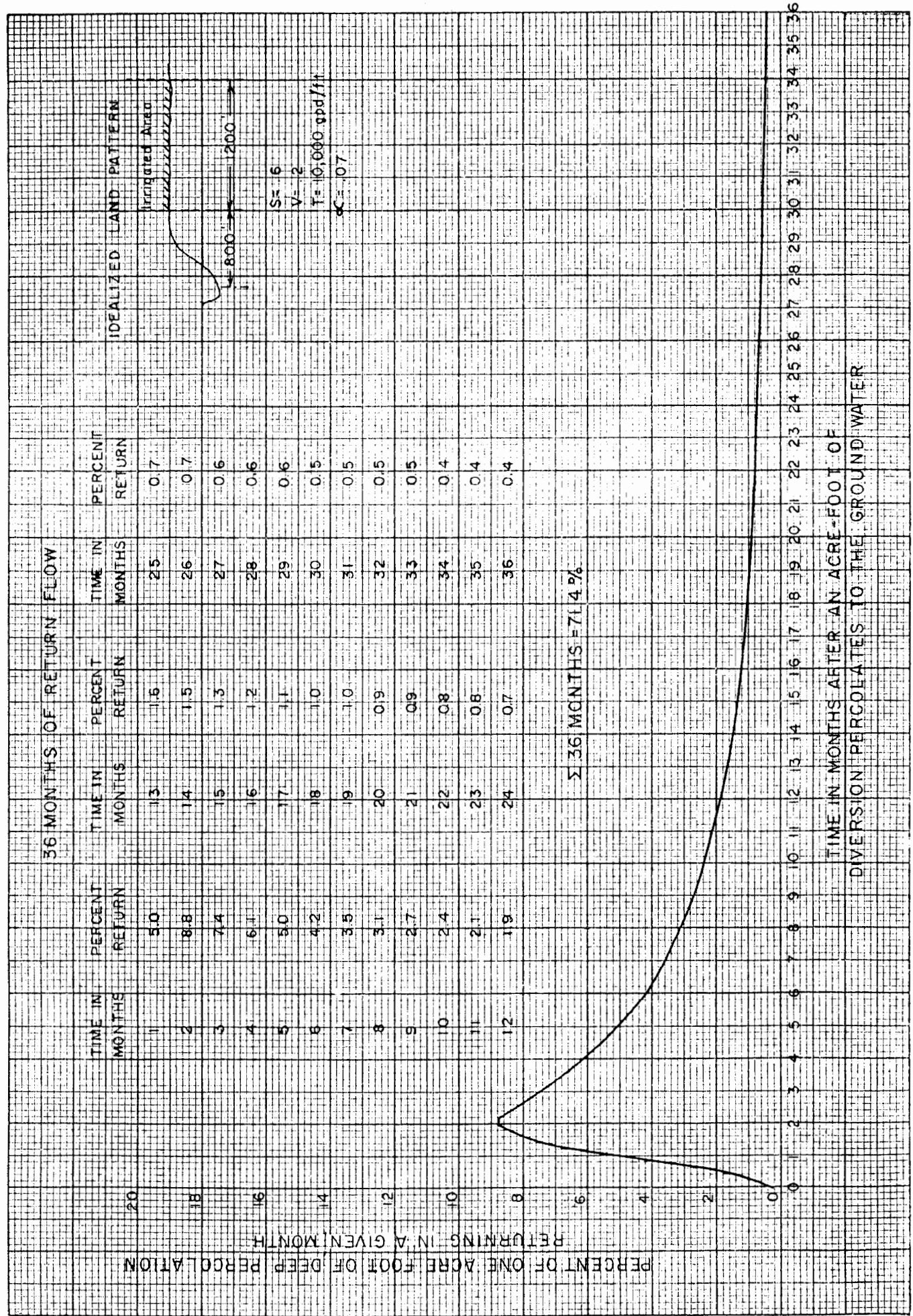


FIGURE 4

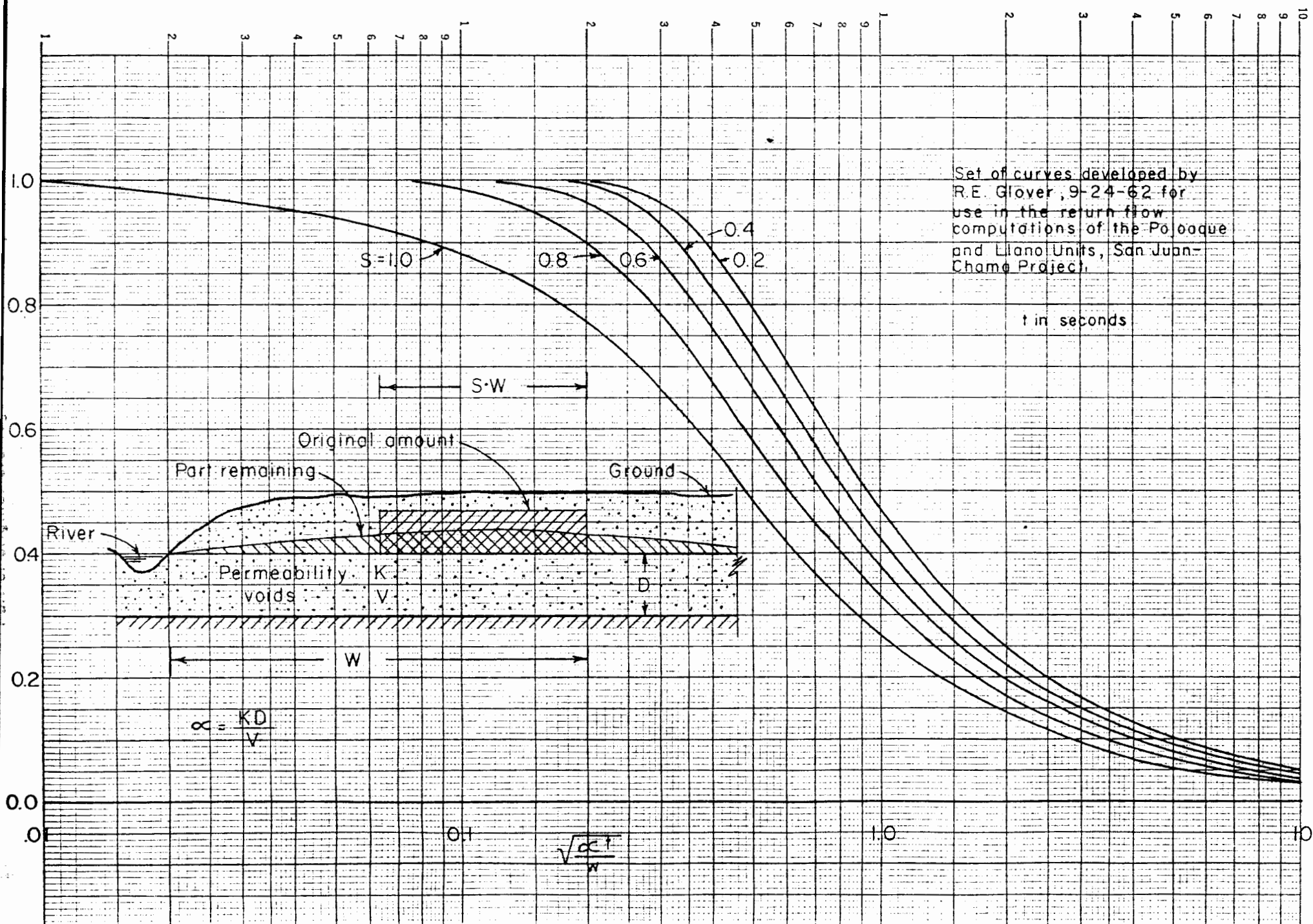


Figure 3

(RO-10-29-76)

(USBR) Contract No. 7-07-51-X0883
(ERDA) Contract No. EY-77-A-32-3856

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRACT FOR FURNISHING A WATER SUPPLY FOR ENERGY RESEARCH
AND DEVELOPMENT ADMINISTRATION'S (ERDA'S) LOS ALAMOS PROJECT AND
RELATED PROGRAMS

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(USBR) Contract No. 7-07-51-X0883
(ERDA) Contract No. EY-77-A-32-3856

1 SAN JUAN-CHAMA PROJECT
2 NEW MEXICO

3 AGREEMENT

4 Between The

5 DEPARTMENT OF THE INTERIOR
6 BUREAU OF RECLAMATION

7 And The

8 ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION (ERDA)

9 For

10 Furnishing a Water Supply
11 For ERDA's Los Alamos Project and Related Programs

12 THIS AGREEMENT is made this _____ day of _____
13 1976, between the DEPARTMENT OF THE INTERIOR, hereinafter called
14 "Interior," acting through the Secretary of Interior, and pursuant
15 to the Federal Reclamation Laws, including particularly the Act of
16 June 13, 1962 (76 Stat. 96), and the Act of April 11, 1956 (70 Stat.
17 105), all as amended or supplemented, and the ENERGY RESEARCH AND
18 DEVELOPMENT ADMINISTRATION, hereinafter called "ERDA," acting pur-
19 suant to Public Law 93-438 and all other applicable laws.

20 WITNESSETH THAT:

Preamble

(10-29-76)

1 WHEREAS, by the Act of Congress approved June 13, 1962
2 (76 Stat. 96), Congress approved the initial stage of the San Juan-
3 Chama Project as a participating project of the Colorado River Storage
4 Project.

5 WHEREAS, the San Juan-Chama Project is approved for
6 furnishing water for municipal, domestic, and industrial uses and
7 for other beneficial purposes.

8 WHEREAS, ERDA is a Federal agency and furnishes water
9 for its Los Alamos Project and related programs, including fur-
10 nishing water to the county of Los Alamos, New Mexico.

11 WHEREAS, the United States has allocated to ERDA
12 1,200 acre-feet per annum of water from the San Juan-Chama Project.

13 WHEREAS, ERDA desires and is empowered to enter into an
14 agreement with Interior for the purpose of obtaining, securing, and
15 supplementing the existing Los Alamos water supply, such water to be
16 used by it for municipal, commercial, residential, and scientific
17 purposes; to pay for such water during the term of this Agreement
18 by agreeing to pay an agreed share of the reimbursable costs of
19 construction, operation, and maintenance of the project in accord-
20 ance with Reclamation Law.

21 NOW THEREFORE, the parties, for and in consideration of
22 the mutual and dependent covenants herein contained, agree as
23 follows:

Preamble

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1. The following terms when used herein, unless otherwise distinctly expressed or manifestly incompatible with the foregoing, shall have the meaning specified.

b. ERDA - shall mean the United States Energy Development Administration, the Administrator of such and Development, or any duly authorized representative.

d. PROJECT - shall mean the San Juan-Chama Project, Mexico, as authorized by the Act of Congress dated (76 Stat. 96).

e. RESERVOIR STORAGE COMPLEX - shall mean all features, lands, and rights-of-way of the project directly associated with the initial collection and storage of project water, and includes all works from the enlargement of the outlet of the

65

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1 existing El Vado Dam upstream to and including and connecting
2 the three diversion dams on the Rio Blanco, Little Navajo, and
3 Navajo Rivers.

4 f. PROJECT WORKS - shall mean all works or facilities
5 constructed including the diversion works, reservoirs, dams, pipe-
6 lines, conduits, and outlet works together with land and rights-
7 of-way for such works.

8 g. PROJECT WATER - shall mean water available for
9 use through the project works.

10 h. WATER FOR PERMITTED PURPOSES - shall mean that
11 portion of the project water to be used or disposed of exclusively
12 by ERDA for municipal, commercial, residential, and scientific
13 purposes.

14 i. WATER SUPPLY COSTS - shall mean that portion of
15 Project costs payable by ERDA to Interior for the water allocated
16 to it from the Project.

17 j. YEAR - shall mean the period January 1 through
18 the next following December 31.

19 WATER ALLOTMENT AND DELIVERY

20 2. a. Use and Allotment of Project Water - The Project
21 is designed to furnish an estimated firm yield from proposed storage
for Project use of approximately 101,800 acre-feet of water annually.
Of this yield, 1,200 acre-feet shall be available annually to ERDA
for permitted use. During periods of scarcity when the actual

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1 available water supply may be less than the estimated firm yield,
2 ERDA shall share in the available water supply in the ratio that
3 1,200 acre-feet bear to the estimated firm yield. During periods
4 of abundance when the actual available water supply may be more
5 than the estimated firm yield, ERDA shall have the right to share
6 in the actual available water supply in the ratio that 1,200 acre-
7 feet bear to the estimated firm yield, all as determined by the
8 Contracting Officer. In utilizing the available water supply to
9 extent permitted by law from the water rights available to
10 the Project, ERDA shall take its water requirements at Heron Dam
11 at the point designated by the Contracting Officer. The respon-
12 sibility of Interior shall cease at Heron Dam, the point of
13 delivery.

14 b. ERDA, in cooperation with the New Mexico State
15 Engineer, shall inform the Contracting Officer, acting as duly
16 authorized representative of the Secretary of the Interior, in
17 writing of the time and amount of water to be released from the
18 point of delivery.

19 WATER CHARGE

20 3. a. ERDA shall pay \$31,200 per year on or before
21 December 31, 1976, and on or before December 31 of each of the
22 succeeding years for the quantity of water for which it has agreed
23 upon pursuant to article 2.a. Each payment shall be in advance
24 for water for the next year.

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1 b. The above water charge is based on actual and
2 estimated costs of the reservoir storage complex as of December
3 1975. The estimated cost includes some programmed work to be
4 completed by October 1, 1978; the exact cost of which has not been
5 determined at this time. Because of this and the fact that other
6 capital improvements may become necessary in the future, the
7 Contracting Officer reserves the right to adjust the rate of
8 charge in paragraph 3.a. upward or downward, consistent with the
9 actual costs. Provided, however, That ERDA's maximum annual repay-
10 ment obligation under this contract shall not exceed \$32,760. If
11 the Contracting Officer concludes at any time that the estimated
12 costs of the reservoir storage complex will cause annual payments
13 to increase more than 5 percent, he shall immediately advise ERDA
14 and unless an amendatory agreement is executed to cover such excess
15 costs, this contract shall terminate.

16 OPERATION AND MAINTENANCE AND REPLACEMENT

17 4. a. The ERDA shall pay its pro rata share of the
18 annual operation, maintenance, and replacement (OM&R) costs of the
19 Project's collection, diversion, and storage complex (reservoir
20 storage complex), based on the ratio of 1,200 acre-feet to the
21 total number of acre-feet under contract by all Contractors for
22 Project Water. Notice of OM&R annual billings for the next
23 calendar year will be issued to ERDA on or before May 1 of each

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1 year with the first such notice to be issued immediately follow-
2 ing the effective date of this Agreement. The first notice will
3 be prorated according to the percentage of time involved if less
4 than a full year. Each notice shall show an itemization of the
5 estimated reimbursable O&M costs of the reservoir storage complex,
6 excluding O&M costs of El Vado Dam and Reservoir, with exception
7 of 27 percent of any replacement costs of the outlet works of said
8 El Vado Dam. When all Project Water has been committed to use by
9 contract, ERDA's water supply costs, under this article, shall
10 include a share of these expenses to be 1.179 percent based on an
11 allotment to it of 1,200 acre-feet of water per annum but not to
12 exceed 1.179 percent of the total water supply available from the
13 Project in any year for all purposes. Prior to the time all water
14 has been allocated by contracts between Interior and the prospective
15 water users, annual reimbursable O&M costs will be apportioned among
16 the existing Contractors in proportion to their maximum allocation
17 of water. ERDA will advance its share of O&M costs for each
18 calendar year on or before December 31 of the preceding year.

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1 In the event the O&M cost estimate falls short of the actual costs
2 in any period or whenever it is anticipated by the Contracting
3 Officer that a deficit will occur during the year, supplemental
4 notices may be issued by the Contracting Officer requesting addi-
5 tional funds. Funds not spent during one calendar year will be
6 carried over for use during the next calendar year with funds
7 required for that year reduced accordingly. In no event shall
8 ERDA's share of O&M cost exceed \$4,800 per year, unless an amendatory
9 agreement is executed to cover such excess O&M costs. If O&M costs
10 exceed \$4,800 in any year and ERDA does not enter into an amendatory
11 agreement for such excess O&M costs, this contract shall terminate.

12 b. The ERDA and other Contractors are not obligated
13 to pay any portion of annual O&M costs allocated to the fish and
14 wildlife function. O&M costs attributed to the fish and wildlife
15 function are now estimated to be 10.24 percent of the annual O&M
16 costs of the reservoir storage complex, excluding El Vado Dam and
17 Reservoir. If unusual circumstances arise which cause the alloca-
18 tion of the O&M costs to fish and wildlife function to be out of
19 balance, an appropriate modification in the percentage figure will

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1 be made by the Contracting Officer, which revision will not
2 be effective against ERDA until ERDA has notice thereof and a
3 60-day period after receipt of notice to review and comment
4 thereon to Contracting Officer.

5 GENERAL OBLIGATION OF ERDA

6 5. In the event of failure, neglect, or refusal of
7 ERDA to pay over to Interior any money then due, Interior may
8 terminate this Agreement upon 6-months written notice or take any
9 other action it deems necessary to compel performance of ERDA of
10 its duties hereunder. Action taken pursuant hereto shall not
11 deprive Interior or limit any remedy provided by this Agreement or
12 by law for the recovery of money due or which may become due under
13 this Agreement.

14 RULES AND REGULATIONS

15 6. The Contracting Officer, after offering ERDA an
16 opportunity for consultation, may make rules and regulations and
17 supply necessary details for administration of this Agreement.
18 Such rules and regulations shall be consistent with provisions of
19 this Agreement and the laws of the United States. The Contracting
20 Officer may add to or modify them as may appear necessary, shall
21 provide ERDA with 60 days' notice before implementing any such
22 modifications, and ERDA shall observe such rules and regulations.

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Art. 5
Art. 6

(10-29-76)

1 DETERMINATION OF FINDINGS OF FACT

2 7. Where terms of this Agreement provide for action to
3 be based upon the opinion or determination of a party to this
4 Agreement, said terms shall not be construed as permitting such
5 action to be predicated upon arbitrary, capricious, or unreasonable
6 opinions or determination whether or not stated to be conclusive.
7 If ERDA questions any determination made by the Contracting Officer,
8 the parties shall meet and seek agreement on the matter. If no
9 agreement is forthcoming, Interior's findings of fact shall be
10 binding upon the parties.

11 COMPLIANCE WITH THE LAW

12 8. All terms and conditions of this Agreement shall be
13 subject to and in conformance with the Federal Reclamation laws,
14 as amended, particularly to the Act of Congress of June 13, 1962
15 (76 Stat. 96, 97; 43 U.S.C. Sections 615 pp. 615xx), and the statutes,
16 compacts, and treaties referenced therein.

17 WATER RIGHTS - WATER SUPPLY GENERAL

18 9. a. Water Shortages - On account of drought or other
19 causes, there may occur at times during any year a shortage in the
20 Quantity of water available from the reservoir storage complex for
21 use by ERDA pursuant to this Agreement. In no event shall any
22 liability accrue against Interior or any of its officers or

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1 employees for any damage, direct or indirect, arising out of any
2 such shortage.

3 b. Quality of Water - Interior makes no warranty
4 as to the quality of the water available to ERDA under this
5 Agreement.

6 c. ERDA's Water Rights - ERDA shall have the
7 exclusive right to allocate among themselves, use and dispose of
8 that share of the Project Water supply available and allocated to
9 them under this Agreement. Water may be used or disposed of for
10 any permitted purpose desired by ERDA. Such use or disposal may be
11 by diverting and applying such water directly from the Rio Grande
12 stream system, by diverting and applying underground water utiliz-
13 ing Project Water to offset the adverse effects of such underground
14 water withdrawals heretofore or hereafter made from the Rio Grande
15 stream system, or otherwise as ERDA may desire.

16 d. Annual Water Carryover Prohibited - Rights to
17 release of water vested in ERDA by this Agreement shall be allowed
18 on an annual basis, and no credits covering any unused water shall
19 be allowed to carry over to any subsequent calendar year.

20 e. Other Uses - The project is authorized for furnish-
21 ing water for irrigation and municipal uses, for providing recreation
22 and fish and wildlife benefits, and for other beneficial purposes.

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1 f. Surplus Water - In any year for which the
2 parties agree that water allocated by this Agreement to ERDA is
3 not in that year to be used or disposed of by ERDA and is legally
4 available for use, such surplus may be disposed of by the Contracting
5 Officer.

6 CONTINGENT ON APPROPRIATIONS OR ALLOTMENT OF FUNDS

7 10. The expenditure of any money or performance of any
8 work by Interior or ERDA as herein provided for, which may require
9 appropriations of money by Congress or the allotment of funds,
10 shall be contingent upon such appropriation or allotments being
11 made. The failure of Congress to appropriate funds or the failure
12 of any allotment of funds shall relieve ERDA from any obligations
13 theretofore accrued under this Agreement and shall give ERDA the
14 right to terminate this Agreement as to any of its executory features.
15 No liability shall accrue against either Interior or ERDA in case
16 of such funds not being appropriated or allotted.

17 NOTICES (STANDARD)

18 11. Any notice demand, or request authorized or
19 required by this agreement shall be deemed to have been given
20 on behalf of ERDA when mailed, postage prepaid, or delivered to the
21 Regional Director, Southwest Region, Bureau of Reclamation, Herring

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Art. 10
Art. 11

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1 Plaza Box H-4377, Amarillo, Texas 79101, and on behalf of Interior,
2 when mailed, postage prepaid, or delivered to Area Manager,
3 Los Alamos Area Office, U.S.E.R.D.A., Los Alamos, New Mexico 87501.
4 Designation of the addressees or the addresses given above may be
5 changed by notice given in the same manner as provided in this
6 article for other notices.

7 AMENDMENT OR REPEAL OF FEDERAL RECLAMATION LAWS

8 12. In the event that the Congress of the United States
9 may repeal or amend any provisions of the Federal Reclamation Laws
10 or any provisions of the Energy Reorganization Act of 1974, Interior
11 and ERDA agree, at the option of either Interior or ERDA as appro-
12 priate, to negotiate amendments of appropriate articles of this
13 Agreement consistent with provisions of laws effecting any such
14 repeal or amendment.

15 CERTIFICATION

16 13. a. Interior certifies that the person executing
17 the Agreement on its behalf is duly authorized by the Secretary of
18 Interior to execute this Agreement.

19 b. ERDA certifies that the person executing the
20 Agreement on its behalf is duly authorized by the Administrator to
21 execute this Agreement.

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Art. 12
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1 ASSIGNMENT LIMITED - SUCCESSORS AND ASSIGNS OBLIGATED

2 14. The provisions of this Agreement shall apply to and
3 bind the successors and assigns of the parties hereto, but no
4 assignment or transfer of this contract or any part or interest
5 therein by ERDA shall be valid until approved by the Contracting
6 Officer.

7 BOOKS, RECORDS, AND REPORTS

8 15. ERDA shall establish and maintain all records
9 pertaining to its financial transactions, water supply, water use,
10 and to other related matters as the Contracting Officer may require.
11 Reports thereon shall be furnished to the Contracting Officer in
12 such form and on such date or dates as he may require. Subject
13 to applicable Federal laws and regulations, each party shall have
14 the right during office hours to examine and make copies of each
15 other's records relating to matters covered by this contract.

16 OFFICIALS NOT TO BENEFIT

17 16. No Member of or Delegate to Congress or Resident
18 Commissioner shall be admitted to any share or part of this con-
19 tract or to any benefit that may arise herefrom, but this restric-
20 tion shall not be construed to extent to this contract if made
21 with a corporation or company for its general benefit.

Art. 14

Art. 15

Art. 16

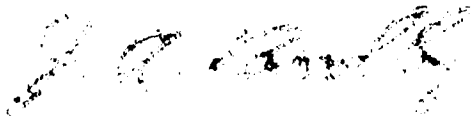
(10-29-76)

1 TERM OF AGREEMENT

2 17. This Agreement shall be effective upon execution by
3 the parties and shall extend for 10 years thereafter: Provided,
4 however, that ERDA shall have the option to renew this Agreement
5 for four succeeding 10-year periods for a total period not to
6 exceed 50 years. ERDA shall give written notice of its exercise
7 of this option at least 90 days prior to the end of each 10-year
8 period.

9 IN WITNESS WHEREOF, the parties hereto have signed their
10 names the day and year first hereinabove written.

11 U.S. DEPARTMENT OF INTERIOR

12 By 
13 Regional Director
14 Southwest Region
15 Bureau of Reclamation

16 Date: JAN 10 1977

17 U.S. Energy Research and
18 Development Administration

19 By _____
20 Title Area Manager
21 Los Alamos Area Office
22 U.S.E.R.D.A.

23 Date: _____

Art. 17
Signatures

(USBR)Contract No. 7-07-51-X0883
(DOE) (ERDA)Contract No. EY-77-A-32-3856
Supplemental Agreement No. M001

THIS SUPPLEMENTAL AGREEMENT is made this 20th day of December, 1977, between the DEPARTMENT OF THE INTERIOR, hereinafter called "Interior," and the DEPARTMENT OF ENERGY, hereinafter called "DOE."

WITNESSETH THAT:

WHEREAS, on January 10, 1977, Interior and the Energy Research and Development Administration (ERDA), entered into an agreement for furnishing a water supply for ERDA's Los Alamos Project and related programs, said agreement bearing USBR No. 7-07-51-X0883 and ERDA No. EY-77-A-32-3856 (hereinafter called "the agreement"); and

WHEREAS, pursuant to the Department of Energy Organization Act (Public Law 95-91), ERDA was abolished and DOE was established, effective October 1, 1977; and

WHEREAS, all of ERDA's functions and responsibilities with respect to the agreement have been transferred to DOE; and

WHEREAS, Interior wishes to increase the maximum O&M charge under paragraph 4.a.; and

WHEREAS, DOE is agreeable to such change; and

WHEREAS, the parties hereto desire to make certain other changes in the Agreement.

NOW, THEREFORE, Interior and DOE agree that the Agreement is hereby amended in the following particulars only:

1. The last recital is revised to read as follows:

WHEREAS, DOE desires and is empowered to enter into an agreement with Interior for the purpose of obtaining, securing, and supplementing the existing Los Alamos water supply, such water to be used by it for municipal, commercial, residential, recreational, and scientific purposes; to pay for such water during the term of this agreement by agreeing to pay an agreed share of the reimbursable costs of construction, operation, and maintenance of the project in accordance with Reclamation Law.

2. The Definition contained in paragraph 1.b. is deleted and the following is substituted therefor:

The term "DOE" means the United States Department of Energy, the Secretary of Energy, or any duly authorized representative of the Secretary. The term "DOE" is substituted for the term "ERDA" and the

phrase "Secretary of Energy" is substituted
for the phrase "Administrator of Energy
Research and Development" wherever they
appear in the Agreement.

3. The maximum O&M shown in paragraph 4.a. is revised from \$4,800
to \$5,500.

All other terms and conditions of the Agreement shall be and remain
unchanged.

IN WITNESS WHEREOF, the parties have executed this Supplemental Agreement
in several counterparts.

U.S. DEPARTMENT OF INTERIOR

By: _____

Date: 12/20/77

U.S. DEPARTMENT OF ENERGY

By: _____

Kenneth R. Braziel
Area Manager
Los Alamos Area Office

Date: _____

(RO-10-5-76)

SAN JUAN-CHAMA PROJECT
NEW MEXICO

CONTRACT

Between The

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

And The

VILLAGE OF LOS LUNAS,
NEW MEXICO

for

Furnishing a Municipal Water Supply
For the Village of Los Lunas,
New Mexico

THIS CONTRACT is made this 19th day of May

1977 between the UNITED STATES OF AMERICA, hereinafter called
"United States," acting through the Secretary of Interior, and pur-
suant to the Federal Reclamation Laws, including particularly the Act
of June 13, 1962 (76 Stat. 96, and the Act of April 11, 1956
(70 Stat. 105), all as amended or supplemented, and the VILLAGE OF
LOS LUNAS, hereinafter called "the Contractor."

WITNESSETH THAT:

Preamble

(RO-10-5-76)

1 WHEREAS, by the Act of Congress approved June 13, 1962
2 (76 Stat. 96), Congress approved initial stage of the San Juan-Chama
3 Project as a participating project of the Colorado River Storage
4 Project.

5 WHEREAS, the San Juan-Chama Project is approved for
6 furnishing water for municipal, domestic, and industrial uses and
7 for other beneficial purposes.

8 WHEREAS, the Contractor furnishes water as a public
9 utility to within the village limits of the village of Los Lunas,
10 New Mexico.

11 WHEREAS, the United States has allocated to the Contractor
12 400 acre-feet per annum of water from the San Juan-Chama Project.

13 WHEREAS, the Contractor is empowered to contract with
14 United States for the purpose of obtaining, securing, and supple-
15 menting the existing Los Lunas water supply, such water to be used
16 by it for municipal purposes to pay for such water during the term
17 of this contract by contracting for the payment of an agreed share
18 of the reimbursable costs of the construction, operation, and
19 maintenance of the project in accordance with Reclamation Law.

20 NOW THEREFORE, the parties for and in consideration of
21 the mutual and dependent covenants herein contained agree as
22 follows:

Preamble

(R0-10-5-76)

DEFINITIONS

1. The following terms when used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, shall have the meaning specified.

5 a. CONTRACTING OFFICER - shall mean the Secretary of
6 the United States Department of the Interior or his duly authorized
7 representative who is, as of the date of execution of this agree-
8 ment on behalf of the United States, the Regional Director,
9 Southwest Region, Bureau of Reclamation.

10 b. FEDERAL RECLAMATION LAWS - shall mean the Act of
11 June 17, 1902 (32 Stat. 388), and all acts amendatory thereof or
12 supplementary thereto.

c. PROJECT - shall mean the San Juan-Chama Project,
Colorado-New Mexico, as authorized by the Act of Congress dated
June 13, 1962 (76 Stat. 96).

d. RESERVOIR STORAGE COMPLEX - shall mean all features, lands, and rights-of-way of the project directly associated with the initial collection and storage of project water, and includes all works from enlargement of the outlet of the existing El Vado Dam upstream to and including and connecting the three diversion dams on the Rio Blanco and Little Navajo and Navajo Rivers.

Art. 1

(RO-10-5-76)

- 1 e. PROJECT WORKS - shall mean all works or facilities
2 constructed including diversion works, reservoirs, dams,
3 pipelines, conduits, and outlet works together with land and rights-
4 of-way for such works.
- 5 f. PROJECT WATER - shall mean water available for
6 use through the project works.
- 7 g. WATER FOR PERMITTED PURPOSES - shall mean that
8 portion of the project water to be used or disposed of exclusively
9 by Contractor for municipal, domestic, and industrial purposes.
- 10 h. WATER SUPPLY COSTS - shall mean that portion of
11 project costs payable by Contractor to the United States for
12 the water allocated to it from the project.
- 13 i. YEAR - shall mean the period January 1 through
14 the next following December 31.
- 15 j. CONTRACTOR - shall mean the village of Los Lunas,
16 New Mexico.

Art. 1

(RO-10-5-76)

1 WATER ALLOTMENT AND DELIVERY

2 2. a. Use and Allotment of Project Water - The project
3 is designed to furnish an estimated firm yield from proposed storage
4 for project use of approximately 101,800 acre-feet of water annually.
5 Of this yield, 400 acre-feet shall be available annually to Con-
6 tractor for permitted use. During period of scarcity when the
7 actual available water supply may be less than the estimated firm
8 yield, Contractor shall share in the available water supply in the
9 ratio that allocations above bear to the estimated firm yield.
10 During periods of abundance when the actual available water supply
11 may be more than the estimated firm yield, Contractor shall have
12 the right to share in the actual available water supply in the
13 ratio that allocations above bear to the estimated firm yield, all
14 as determined by the Contracting Officer. In utilizing the avail-
15 able water supply to the extent permitted by law from the water
16 rights available to the project, Contractor shall take its water
17 requirements at Heron Dam at the point designated by the Contracting
18 Officer. The responsibility of the United States shall cease at the
19 point of delivery.

20 b. The Contractor, in cooperation with the
21 New Mexico State Engineer, shall inform the Contracting Officer,

Art. 2

(RO-10-5-76)

1 acting as duly authorized representative of the Secretary of
2 the Interior, in writing of the time and amount of water to be
3 released.

4 WATER CHARGE

5 3. a. In accordance with Section 9(c)(2) of the Act
6 of Congress of August 4, 1939 (53 Stat. 1187, 1194; 43 U.S.C.
7 Section 485h(c)(1970)), the Contractor shall pay \$10,400 per
8 year on or before December 31, 1977, and on or before December 31
9 of each of the succeeding 39 years for the quantity of water for
10 which they have contracted pursuant to article 2.a. Each pay-
11 ment shall be in advance for water for the next year.

12 b. The above water charge is based on actual and
13 estimated costs of the reservoir storage complex as of December
14 1975. The estimated cost includes some programmed work to be
15 completed by October 1, 1978; the exact cost of which has not been
16 determined at this time. Because of this and the fact that other
17 capital improvements may become necessary in the future, the
18 Contracting Officer reserves the right to adjust the rate of
19 charge in paragraph 3.a. upward or downward, consistent with the
20 actual costs.

Art. 2
Art. 3

(RO-10-5-76)

1 OPERATION AND MAINTENANCE AND REPLACEMENT

2 4. a. The Contractor shall pay its pro rata share
3 of the annual operation, maintenance, and replacement (OM&R)
4 costs of the project's collection, diversion, and storage complex
5 (reservoir storage complex), based on the ratio of 400 acre-
6 feet to the total number of acre-feet under contract by all
7 contractors for project water. Notice of OM&R annual billings
8 for the next calendar year will be issued to the Contractor on
9 or before May 1 of each year with the first such notice to be
10 issued immediately following the effective date of this contract.
11 The first notice will be prorated according to the percentage of
12 time involved if less than a full year. Each notice shall show
13 an itemization of the estimated reimbursable O&M costs of the
14 reservoir storage complex, excluding O&M costs of El Vado Dam
15 and Reservoir, with exception of 27 percent of any replacement
16 costs of the outlet works of said El Vado Dam. When all project
17 water has been committed to use by contract, the Contractor's
18 water supply costs, under this article, shall include a share of
19 these expenses to be 0.393 percent based on an allotment to it of
20 400 acre-feet of water per annum but not to exceed 0.393 percent
21 of the total water supply available from the project in any year
22 for all purposes. Prior to the time all water has been allocated

Art. 4

(RO-10-5-76)
(Rev. RO-12-3-76)

1 by contracts between the United States and the prospective water
2 users, annual reimbursable O&M costs will be apportioned among
3 the existing contractors in proportion to their maximum allocation
4 of water. The Contractor will advance its share of O&M costs for
5 each calendar year on or before December 31 of the preceding year.
6 In the event the O&M cost estimate falls short of the actual
7 costs in any period or whenever it is anticipated by the Con-
8 tracting Officer that a deficit will occur during the year,
9 supplemental notices may be issued by the Contracting Officer
10 requesting additional funds. Funds not spent during one calendar
11 year will be carried over for use during the next calendar year
12 with funds required for that year reduced accordingly.

Art. 4

(RO-10-5-76)

1 b. The Contractor is not obligated to pay any
2 portion of annual O&M costs allocated to the fish and wildlife
3 function. O&M costs attributed to the fish and wildlife function
4 are now estimated to be 10.24 percent of the annual O&M costs of
5 the reservoir storage complex, excluding El Vado Dam and Reservoir.
6 If unusual circumstances arise which cause the allocation of the
7 O&M costs to fish and wildlife function to be out of balance, an
8 appropriate modification in the percentage figure will be made by
9 the Contracting Officer, 60 days after receipt by the Contractor
10 of a written notice of the modification.

11 INTEREST FOR DELINQUENT PAYMENTS

12 5. The Contractor shall pay interest to the United
13 States on installments or charges which become delinquent com-
14 puted at the rate of 1 percent per month of the amount of such
15 delinquent installments or charges each day from such delinquency
16 until paid; Provided, that no interest shall be charged the Con-
17 tractor unless such delinquency continues for more than 30 days;
18 in which event, the interest shall accrue from the initial date of
19 delinquency.

Art. 4
Art. 5

(RO-10-5-76)

1 GENERAL OBLIGATION OF CONTRACTOR TO LEVY TAXES
2 AND ASSESSMENTS--BENEFITS CONDITIONED UPON PAYMENTS

3 6. a. The Contractor is obligated to pay the
4 United States, as provided in this contract, notwithstanding
5 the manner in which the obligation may be distributed among the
6 individual water users in the village. Nothing in this contract
7 shall be construed as requiring the Contractor to take any action
8 or use any funds in contravention of sections 10, 12, or 13,
9 article IX, New Mexico Constitution.

10 b. In the event of failure, neglect, or refusal of
11 the Contractor to pay over to the United States any money then
12 due, the United States may terminate this contract upon 6 months
13 written notice or take any other action it deems necessary to
14 compel performance of the Contractor of its duties hereunder.
15 Action taken pursuant hereto shall not deprive the United States
16 or limit any remedy provided by this contract or by law for the
17 recovery of money due or which may become due under this contract.

18 RULES AND REGULATIONS

19 7. The Contracting Officer, after offering the
20 Contractor an opportunity for consultation, may make rules and
21 regulations and supply necessary details for administration of this
22 contract. Such rules and regulations shall be consistent with

Art. 6

Art. 7

(RO-10-5-76)

1 provisions of this contract, the laws of the United States, and
2 laws of the State of New Mexico. The Contracting Officer may add
3 to or modify them as may appear necessary, and the Contractor shall
4 observe such rules and regulations.

5 DETERMINATION OF FINDINGS OF FACT

6 8. Where terms of this contract provide for action
7 to be based upon the opinion or determination of a party to this
8 contract, said terms shall not be construed as permitting such action
9 to be predicated upon arbitrary, capricious, or unreasonable opinions
10 or determination whether or not stated to be conclusive. If the
11 Contractor questions any determination made by the Contracting
12 Officer, findings of fact shall be made by the Secretary, as
13 appropriate to the issue, after consultation with the Contractor
14 and shall be binding upon the parties.

15 COMPLIANCE WITH THE LAW

16 9. All terms and conditions of this contract shall be
17 subject to and in conformance with the Federal Reclamation laws,
18 as amended, particularly to the Act of Congress of June 13, 1962
19 (76 Stat. 96, 97; 43 U.S.C. Section 615pp. 615xx), and the statutes,
20 compacts, and treaties referenced therein.

Art. 7
Art. 8
Art. 9

(RO-10-5-76)

1 WATER RIGHTS - WATER SUPPLY GENERAL

2 10. a. Water Shortages - On account of drought or other
3 causes, there may occur at times during any year a shortage in
4 the quantity of water available from the reservoir storage complex
5 for use by Contractor pursuant to this contract. In no event
6 shall any liability accrue against the United States or any of its
7 officers or employees for any damage, direct or indirect, arising
8 out of any such shortage.

9 b. Quality of Water - The United States makes no
10 warranty as to the quality of the water available to Contractor
11 under this contract.

12 c. Contractors Water Rights - Contractor shall have
13 the exclusive right to allocate use and dispose of that share of
14 the project water supply available and allocated to them under this
15 contract. Water may be used or disposed of for any permitted pur-
16 pose desired by contractor. Such use or disposal may be by divert-
17 ing and applying such water directly from the Rio Grande stream
18 system, by diverting and applying underground water utilizing
19 project water to offset the adverse effects of such underground
20 water withdrawals heretofore or hereafter made from the Rio Grande
21 stream system, or otherwise as the Contractor may desire.

Art. 10

(RO-10-5-76)

1 d. Annual Water Carryover Prohibited - Rights
2 to release of water vested in Contractor by this contract shall
3 be allowed on an annual basis, and no credits covering any unused
4 water shall be allowed to carry over to any subsequent calendar
5 year.

6 e. Other Uses - The project is authorized for fur-
7 nishing water for irrigation and municipal uses, for providing
8 recreation and fish and wildlife benefits, and for other beneficial
9 purposes. The supply to be available for water users of Con-
10 tractor and the costs payable by Contractor for a municipal water
11 supply reflect apportionment among these purposes and regulation
12 of releases.

13 f. Surplus Water - In any year for which the
14 Contracting Officer determines that water allocated by this
15 contract to Contractor is not in that year to be used or dis-
16 posed of by Contractor and is legally available for use, such
17 surplus may be disposed of by the Contracting Officer.

18 WATER AND AIR POLLUTION CONTROL (STANDARD)

19 11. The Contractor, in carrying out this contract, shall
20 comply with all applicable water and air pollution laws and regu-
21 lations of the United States and the State of New Mexico and shall
22 obtain all required permits or licenses from the appropriate Federal,
23 State, or local authorities.

Art. 10
Art. 11

EQUAL OPPORTUNITY (STANDARD)

12. During the performance of this Contract, the Contractor agrees as follows:

a. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

c. The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

d. The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

e. The Contractor will furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

1 f. In the event of the Contractor's noncompliance
2 with the Equal Opportunity clause of this Contract or with any
3 of the said rules, regulations, or orders, this contract may be
4 canceled, terminated, or suspended, in whole or in part, as to
5 the noncomplying Contractor and such Contractor may be declared
6 ineligible for further Government contracts in accordance with
7 procedures authorized in said amended Executive Order, and such
8 other sanctions may be imposed and remedies invoked as provided
9 in said Executive Order, or by rules, regulation, or order of
10 the Secretary of Labor, or as otherwise provided by law.

11 g. The Contractor will include the provisions of
12 paragraphs a. through g. in every subcontract or purchase order
13 unless exempted by rules, regulations, or orders of the Secretary
14 of Labor issued pursuant to Section 204 of said amended Executive
15 Order, so that such provisions will be binding upon each sub-
16 contractor or vendor. The Contractor will take such action with
17 respect to any subcontract or purchase order as the Contracting
18 Officer may direct as a means of enforcing such provisions,
19 including sanctions for noncompliance: Provided, however, that
20 in the event the Contractor becomes involved in, or is threatened
21 with, litigation with a subcontractor or vendor as a result of
22 such direction by the Contracting Officer, the Contractor may
23 request the United States to enter into such litigation to protect
24 the interests of the United States.

25 TITLE VI, CIVIL RIGHTS ACT OF 1964 (STANDARD)

26 13. a. The Contractor agrees that it will comply with
27 Title VI of the Civil Rights Act of July 2, 1964 (78 Stat. 241)
28 and all requirements imposed by or pursuant to the Department of
29 the Interior Regulation (43 CFR 17) issued pursuant to that Title,
30 to the end that, in accordance with Title VI of that act and the
31 regulation, no person in the United States shall, on the grounds
32 of race, color, sex, or national origin be excluded from partici-
33 pation in, be denied the benefits of, or be otherwise subjected
34 to discrimination under any program or activity for which the
35 Contractor receives financial assistance from the United States
36 and hereby gives assurance that it will immediately take any
37 measure to effectuate this agreement.

38 b. If any real property or structure thereon is pro-
39 vided or improved with the aid of Federal financial assistance
40 extended to the Contractor by the United States, this assurance
41 obligates the Contractor, or, in the case of any transfer of such

Art. 12
Art. 13

1 property, any transferee for the period during which the real
2 property or structure is used for a purpose involving the provision
3 of similar services or benefits. If any personal property is so
4 provided, this assurance obligated the Contractor for the period
5 during which they retain ownership or possession of the property.
6 In all other cases, this assurance obligates the Contractor for
7 the period during which the Federal financial assistance is
8 extended to it by the United States.

9 c. This assurance is given in consideration of and
10 for the purpose of obtaining any and all Federal grants, loans,
11 contracts, property, discounts, or other Federal financial
12 assistance extended after the date hereof to the Contractor by
13 the United States, including installment payments after such date
14 on account of arrangements for Federal financial assistance which
15 were approved before such date. The Contractor recognizes and
16 agrees that such Federal financial assistance will be extended in
17 reliance on the representations and agreements made in this
18 assurance and that the United States shall reserve the right to
19 seek judicial enforcement of this assurance. This assurance is
20 binding on the Contractor, its successors, transferees, and
21 assignees.

22 CONTINGENT ON APPROPRIATIONS OR ALLOTMENT OF FUNDS (STANDARD)

23 14. The expenditure or advance of any money or the
24 performance of any work by the United States hereunder, which may
25 require appropriations of money by Congress or the allotment of
26 funds, shall be contingent upon such appropriation or allotment
27 being made. The failure of the Congress to appropriate funds or
28 the absence of any allotment of funds shall not relieve the Con-
29 tractor from any obligations under this contract. No liability
30 shall accrue to the United States in case of such funds not
31 appropriated or allotted.

32 NOTICES (STANDARD)

33 15. a. Any notice demand, or request authorized or
34 required by this contract shall be deemed to have been given on
35 behalf of the Contractor when mailed, postage prepaid, or delivered
36 to the Regional Director, Southwest Region, Bureau of Reclamation,
37 Herring Plaza Box H-4377, Amarillo, Texas 79101, and on behalf of
38 the United States, when mailed, postage prepaid or delivered to the
39 village of Los Lunas, New Mexico, Attention: Mayor, Post Office Box 96,
40 Los Lunas, New Mexico 87031. The designation of the addressees or the
41 addresses given above may be changed by notice given in the same
42 manner as provided in this article for other notices.

Art. 13
Art. 14
Art. 15

1 AMENDMENT OR REPEAL OF FEDERAL RECLAMATION LAWS

2 16. In the event that the Congress of the United States
3 may repeal or amend any provisions of the Federal Reclamation Laws,
4 the United States agrees, at the option of the Contractor, to nego-
5 tiate amendments of appropriate articles of this Contract consistent
6 with provisions of laws effecting any such repeal or amendment.

7 CERTIFICATION

8 17. a. The United States certifies that the person
9 executing the contract on its behalf is duly authorized by the
10 Secretary of Interior to execute this contract.

11 b. The Contractor certifies, that as to it, the
12 execution of this contract is duly authorized by law; that all
13 acts, conditions, and things required to exist precedent to this
14 contract, to render the same lawful and valid, have been properly
15 done and happened and have been performed in regular and due time
16 as required by the Constitution and laws of the State of New Mexico,
17 and that this contract does not exceed any constitutional or statu-
18 tory limitations.

19 ASSIGNMENT LIMITED - SUCCESSORS AND ASSIGNS OBLIGATED

20 18. The provisions of this contract shall apply to and
21 bind the successors and assigns of the parties hereto, but no assign-
22 ment or transfer of this contract or any part or interest therein
23 shall be valid until approved by the Contracting Officer.

Art. 16
Art. 17
Art. 18

(RO-10-5-76)
(Rev. RO-12-3-76)

1 BOOKS, RECORDS, AND REPORTS

2 19. The Contractor shall establish and maintain all
3 records pertaining to its financial transactions, water supply water
4 use, and to other matters as the Contracting Officer may require.
5 Reports thereon shall be furnished to the Contracting Officer in such
6 form and on such date or dates as he may require. Subject to appli-
7 cable Federal laws and regulations, each party shall have the right
8 during office hours to examine and make copies of each other's records
9 relating to matters covered by this contract.

10 OFFICIALS NOT TO BENEFIT

11 20. No Member of or Delegate to Congress or Resident
12 Commissioner shall be admitted to any share or part of this contract
13 or to any benefit that may arise herefrom, but this restriction
14 shall not be construed to extend to this contract if made with a
15 corporation or company for its general benefit.

16 TERM OF CONTRACT

17 21. This contract shall be effective upon execution by
18 all parties through December 31, 2017: Provided, however, That the
19 first water delivery shall not be made available to the contractor
20 until calendar year 1978; and Provided, That this contract may be
21 renewed at the option of the Contractor for an additional period
22 upon terms and conditions satisfactory to the parties hereto.

Art. 19
Art. 20
Art. 21

(RO-10-5-76)

1 IN WITNESS WHEREOF, the parties hereto have signed their
2 names the day and year first hereinabove written.

3 THE UNITED STATES OF AMERICA

4 By Robert H. Weimer
5 Regional Director, Southwest Region
6 Bureau of Reclamation

7 ATTEST: THE VILLAGE OF LOS LUNAS, NEW MEXICO

8 Agatha Chabot
9 Village Clerk

By E. Castellano
Title MAYOR

Signatures

WEATHER CONDITIONS

INSTRUCTIONS

1. Fill out for each project and include in annual operation and maintenance report.

2. Use project weather record data when available. Where such data is not kept use weather report of any U.S. Weather Bureau observation station applicable to project conditions.

PROJECT San Juan-Chama, Colorado-New Mexico STATION Chama - Chama, New Mexico YEAR 1977

MONTH	TEMPERATURE • °F			PRECIPITATION			EVAPO- RATION (inches)	TOTAL WIND MOVEMENT (miles)	SKY		
				Total (inches)	Greatest 24-Hour				NUMBER OF DAYS		
	Maximum	Minimum	Mean		(amt. inches)	Date			clear	part cloudy	cloudy
January	47	-20	16	1.55	0.39	3					
February	52	-2	24	0.20	0.09	24					
March	57	-5	28	0.42	0.17	10					
April	66	0	42	0.99	0.25	20					
May	80	17	47	1.24	0.58	14					
June	86	30	60	0.81	0.40	6					
July	87	40	62	2.75	0.75	5					
August	88	35	62	4.24	1.05	18					
September	82	25	55	2.39	0.77	22					
October	71	18	46	0.95	0.52	6					
November	64	4	34	1.54	0.78	7					
December	54	-10	26	0.85	0.41	31					
THE YEAR	88	-20	34	17.93	1.05						

Date last killing
Spring frost.

Date first killing
Fall frost.

Dates of serious rainfall.

Dates of hail storms.

Dates of windstorms.

Description of evaporation station.

REMARKS

WEATHER CONDITIONS

INSTRUCTIONS

1. Fill out for each project and include in annual operation and maintenance report.

2. Use project weather record data when available. Where such data is not kept use weather report of any U.S. Weather Bureau observation station applicable to project conditions.

PROJECT San Juan-Chama STATION Santa Fe College - Santa Fe, New Mexico YEAR 1977

MONTH	TEMPERATURE - °F			PRECIPITATION			EVAPO- RATION (inches)	TOTAL WIND MOVEMENT (miles)	SKY		
				Total (inches)	Greatest 24-Hour				NUMBER OF DAYS		
	Maximum	Minimum	Mean		(amt. inches)	Date			clear	part cloudy	cloudy
January	48	3	26	0.55	0.24	7					
February	60	9	34	0.44	0.20	26					
March	62	11	37	0.44	0.20	6					
April	74	16	49	1.46	0.45	20	-	-			
May	84	35	57	0.91	0.82	13	10.64	2655			
June	90	50	69	0.13	0.06	30	10.67	1237			
July	91	50	71	3.28	1.00	9	9.79	990			
August	93	52	71	3.00	1.13	11	9.33	1105			
September	89	40	64	0.74	0.27	13	6.87	1090			
October	78	28	55	0.46	0.30	23	-	-			
November	68	14	42	1.66	0.90	7					
December	57	-3	32	0.17	0.14	29					
THE YEAR	93	-3	45	13.24	1.13		47.50				

Date last killing Spring frost. Date first killing Fall frost. Dates of serious rainfall. Dates of hailstorms. Dates of windstorms.

Description of evaporation station.

REMARKS

GPO 843-690

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

MONTHLY WATER DISTRIBUTION

Project San Juan-Chama Area Irrigated 61,260 Year 1977

QUANTITIES IN ACRE-FEET

MONTH	<u>1/</u> Diverted from Stream 1	Inflow from Reservoirs and other sources	Delivered to Reservoirs 2	<u>2/</u> Net Supply 3	Main Canal Waste	Main Canal Losses	Delivered to Laterals 4	Lateral Waste	Lateral Losses	Non-irrigation Deliveries 4	DELIVERED TO FARMS	
											Total	Per Acre
January,	0			0						0		
February,	0			0						0		
March,	795			314						481		
April,	655			229						426		
May,	867			36						831		
June,	10,859			9,974						885		
July,	11,452			10,863						589		
August,	5,130			178						4,952		
September,	8,419			66						8,353		
October,	5,486			10						5,476		
November,	199			44						155		
December,	12,944			116						12,828		
Total,	56,806			21,830						34,976		
Acre ft. per acre,												
Per cent Net Supply,												

1 Diversion amount exclusive of waste at head gates for sand sluicing, etc.

2 Reservoirs connected with distributing system only.

3 Diversions plus inflow from reservoirs and other sources less delivery to reservoirs.

4 Do not include power.

a Measured at _____

b Measured at _____

1/ SJ-C released from Heron Reservoir.

2/ Released from Heron Reservoir for irrigation.

C.P.D. 24385

ANNUAL SUMMARY - WATER DISTRIBUTION - OPERATION AND MAINTENANCE COSTS

For Year 1977

Sheet 2 of 4

REGION Southwest	PROJECT San Juan-Chama	STATE(S) New Mexico
---------------------	---------------------------	------------------------

WATER DISTRIBUTION (Acre-Feet)

LINE NO.	DIVISION, UNIT AND DISTRICT	DO NOT USE THIS SPACE (1-20)	NET SUPPLY (21-29)	OPERATIONAL SPILLS (30-38)	TRANS- PORTATION LOSSES (39-47)	NONAGRICULTURAL DELIVERIES			DELIVERED TO FARMS (72-81)
						MUNICIPAL INDUSTRIAL (48-55)	URBAN/ SUBURBAN INDUSTRIAL (56-63)	MISCEL- LANEOUS (64-71)	

PART A. PROJECT WATER

1			34,976			24,505		10,471 ^{2/}	
2									
3									
4									
5									
6									
7									
8									
9									
10	TOTAL PART A		34,976			24,505		10,471	

PART B. NONPROJECT WATER

11	PART B								
12	TOTAL PART A PLUS PART B								

1/ Delivered for irrigation of urban, suburban and industrial lands as reported on line 66 of form 7-314. Use asterisks to identify estimated quantities and numerals to relate any required explanatory notes. Place appropriate identifiers to left of and in same box with data involved.

NOTES: ^{2/} 10,471 acre-feet fish and wildlife and recreation enhancement.

ANNUAL SUMMARY - WATER DISTRIBUTION - OPERATION AND MAINTENANCE COSTS

For Year 1977 Sheet 3 of 4

REGION	PROJECT	STATE(S)
Southwest	San Juan-Chama	New Mexico

OPERATION AND MAINTENANCE COSTS (Dollars)

LINE NO.	DIVISION, UNIT AND DISTRICT	DO NOT USE THIS SPACE	TOTAL COSTS		ALLOCATED COSTS - IRRIGATION			
					AGRICULTURAL		URBAN, SUBURBAN INDUSTRIAL	
			WORKS OPERATED BY					
			BUREAU	WATER USERS	BUREAU	WATER USERS	BUREAU	WATER USERS
			(1-20)	(21-28)	(29-36)	(37-44)	(45-52)	(53-60)

PART A. REPORTED COSTS

1			\$28,019	\$235,850	\$67,687			
2								
3								
4								
5								
6								
7								
8								
9								
10	TOTAL PART A		\$28,019	\$235,850	\$67,687			

PART B. ESTIMATED COSTS

11	PART B							
12	TOTAL PART A PLUS PART B		\$28,019	\$235,850	\$67,687			

NOTES: 1/ 10.24 percent (\$26,931) of O&M costs credited from appropriated nonreimbursable funds as provided under Public Law 88-293. \$1,088 recreation management funds.

ANNUAL SUMMARY - WATER DISTRIBUTION - Operation and Maintenance Costs

For Year 1977 Sheet 4 of 4

REGION Southwest	PROJECT San Juan-Chama	STATE(S) New Mexico
---------------------	---------------------------	------------------------

OPERATION AND MAINTENANCE COSTS (Dollars)

DIVISION, UNIT AND DISTRICT	DO NOT USE THIS SPACE (1-20)	ALLOCATED COSTS			
		MUNICIPAL INDUSTRIAL		OTHER	
		WORKS OPERATED BY			
		BUREAU (21-28)	WATER USERS (29-36)	BUREAU (37-44)	WATER USERS (45-52)
PART A. REPORTED COSTS					
1		\$168,163			
2					
3					
4					
5					
6					
7					
8					
9					
10	TOTAL PART A		\$168,163		
PART B. ESTIMATED COSTS					
11	PART B				
12	TOTAL PART A PLUS PART B		\$168,163		

NOTES:

1-5)

San Juan-Chama

STATUS OF WATER USERS IS 77

REGION STATE(S)

SW

New Mexico

LINE NO.	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
	PART A. IRRIGATION USERS	DATA CARD	NUMBER OF FARMS	IRRIGABLE ACRES <u>1/</u>	ACRE-FEET OF WATER DELIVERED	POPULATION	CONTR. COUNT	ADD CODE
1	FULL TIME FARMS		OPERATING FARMS					
2	Full Irrigation Service	6-24						
3	Supplemental Irrigation Service	25-43		84,378	21,830			
4	Temporary Irrigation Service	44-62						2
5	PART TIME FARMS							
6	Full Irrigation Service	6-24						
7	Supplemental Irrigation Service	25-43						
8	Temporary Irrigation Service	44-62						1
9	URBAN, SUBURBAN AND INDUSTRIAL LANDS							
10	Full Irrigation Service	6-24						
11	Supplemental Irrigation Service	25-43						
12	Temporary Irrigation Service	44-62						1
13	TOTALS, PART A			84,378	21,830			
14	PART B. MUNICIPAL AND INDUSTRIAL USERS							
15	M & I PRIME CONTRACTORS							
16	City of Albuquerque	6-21			17,700 <u>2/</u>	244,000		
17	Santa Fe Municipal Water Board	6-21			5,605	41,000		
18	Department of Energy	6-21			1,200	11,300		
19		6-21						
20		6-21						
21		6-21						
22		6-21						
23		6-21						
24		6-21						
25		6-21						
26		6-21						
27		6-21						
28		6-21						
29		6-21						
30		6-21						
31		6-21						
32		6-21						
33		6-21						
34		6-21						
35		6-21						
36		6-21						

NOTES: 1. REPORT EACH STATE PORTION OF DATA

- 1/ Includes MRGCD, Pojoaque Valley Irrig. Dist., and Indian lands.
 2/ Includes 17,100 acre-feet for prime contractor and 600 acre-feet for sub-contractors.

RECREATION AND WILDLIFE SUMMARY
CALENDAR YEAR 1977

FORM APPROVED
BUDGET BUREAU NO. 42-R1325.2

Refer To Instruction Sheet Form 7-1643 A For Instructions On How To Fill Out
This Report Form.

AREA: Heron Dam and Reservoir REGION: SW PROJECT: San Juan-Chama STATE: New Mexico

PART I-GENERAL INFORMATION

1. ADMINISTERING AGENCIES									
1a. NAME	1b. ADDRESS	1c. DATE OF AGREEMENT	1d. PURPOSE	1e. ACREAGE					
				LAND	WATER				
New Mexico State Park & Recreation Comm.	P.O. Box 1147, Santa Fe, New Mexico 87503	8-29-73	RECREATION	4,107	5,905				

2. PHYSICAL FEATURES					
2a. TOTAL AREA (Fee & Withdrawn) IN ACRES		2b. AREA AVAILABLE FOR RECREATION IN ACRES		2c. FLOWAGE EASEMENT LANDS IN ACRES	2d. SHORELINE LENGTH IN MILES
LAND	WATER	LAND	WATER		
4,107	5,905	4,107	5,905		39 1/2

3. MANAGEMENT PRACTICES										
3a. RECREATION OPERATION AND MAINTENANCE (In Man Years)	3b. FEES									
	3b.(1) PARKING		3b.(2) CAMPING		3b.(3) PICNICKING		3b.(4) BOAT LAUNCHING		3b.(5) CAMPSITE RENTAL	
	AMOUNT	PER	AMOUNT	PER	AMOUNT	PER	AMOUNT	PER	AMOUNT	PER
4	\$		\$	2/	\$		\$	3/	\$	

PART II-RECREATION FACILITIES INVENTORY

4. ACCESS ROADS (No.) 2	5. INTERIOR ROADS (Miles) 6	6. PARKING (Car Spaces) 15	7. CAMPGROUNDS (No.) 2	7a. TENT SPACES (No. In Campsite) 1	7b. TRAILER SPACES (No. In Campsite) 1	8. PICNIC AREAS (No.) 2
9. PICNIC TABLES (No.) 32	10. PICNIC SHELTERS (No.) 12	11. TOILETS (No.) 12	12. DRINK WATER OUTLETS (No.) 3	13. SWIMMING BEACHES (No.) 1	14. BOAT LAUNCHING RAMPS (No.) 1	15. BOAT DOCKS (Capacity) 1

16. CAMPSITES (No.)				17. DEER AND CAMP			
16a. TOTAL	16b. CAMPER ONLY	16c. LEANED	16d. NOT LEANED	17a. TOTAL NO. SLED	17b. KIND & CAPACITY	17c. KIND & CAPACITY	17d. KIND & CAPACITY

18. CONCESSIONS			
18a. TOTAL NO. OF CONCESSIONS	18b. LODGING CAPACITY	18c. RENTAL BOATS (No.)	18d. CAFES (No.)

PART III-VISITATION

	VISITOR DAYS		29. PEAK DAY (No. of Visitors)	THIS YEAR	LAST YEAR
	THIS YEAR	LAST YEAR			
19. SIGHTSEEING	966	3,863	7,679	1,575	2,000
20. PICNICKING	235	705	8,808		
21. CAMPING	5,299	5,299	23,038	17,600	33,504
22. SWIMMING	920	2,760	4,517	31. DISTRIBUTION OF TOTAL VISITATION (In %)	
23. WATERSKIING	3,288	13,153	0	31a. LOCAL	10 %
24. BOATING	2,943	8,830	16,149	31b. OTHER	90 %
25. FISHING	40,503	81,005 1/2	28,685	31c. TOTAL	100 %
26. HUNTING	80	160	4,000		
27. OTHER	1,472	4,415 1/2	7,632		
28. TOTAL VISITATION	*55,706	120,190	100,511		

PART IV-WATERCRAFT USE

32. BOAT DAYS FOR			33. PEAK DAY USE (No. of Boats) FOR		
32a. POWERBOATS	32b. ROWBOATS AND SAIL-BOATS	32c. TOTAL	33a. POWERBOATS	33b. ROWBOATS AND SAIL-BOATS	33c. TOTAL
1,000	200	1,200	100	25	125

*Visitation by 12-hour definition

1977

PART VI--VALUE OF PUBLIC USE FACILITIES AND O&M COSTS						
8. TOTAL VALUE	9. U.S.I.R.	10. ADM. AGENCY	11. CONCESSIONS	12. ORGANIZED CAMPS	13. PRIVATE CAIENS	14.
	214,011	398,000				
15. VALUE ADDED THIS YEAR	9,291					
16. O&M COSTS THIS YEAR	300	44,677				

- 1/ Conservation pool elevation 7,186.0
- 2/ Camping - \$2 overnight with no electrical hookup
\$3 overnight with electricity
\$4 overnight with sewer hookup
- 3/ Boating fees - Less than 16' - \$7.50
16' to less than 26' - \$10.00
26' to less than 40' - \$12.50
40' to less than 65' - \$15.00
65' and up - \$20.00
- 4/ Better census information
- 5/ In accordance with New Mexico park rules and regulations, operation of off road vehicles is restricted to established roadways within the park area.

William S. Huey, Director

1-27-78

CROP PRODUCTION REPORT 1977

PROJECT AND SUBDIVISION: SAN JUAN CHAMA
STATE: NEW MEXICO
TYPE OF IRRIGATION SERVICE: SUPPLEMENTAL

REGION 5W

ACREAGE SUMMARY

	CLASS 1-4	CLASS 5	TOTAL
LANDS IN IRRIGATION ROTATION (ACRES)			
21 HARVESTED CROPLAND AND PASTURE (FROM LINE 194)	1.029		1.029
22 CROPLAND NOT HARVESTED			
23 SOIL BUILDING			
24 ACRES IRRIGATED (LINES 21 + 22 + 23)	1.029		1.029
25 FALLOW OR IDLE	1.739		1.739
26 TOTAL AREA IN IRRIGATION ROTATION (CULTIVATION) (LINES 24 + 25)	2.768		2.768
LANDS NOT IN IRRIGATION ROTATION (ACRES)			
27 DRY CROPPED			
28 IDLE, FALLOW, OR GRAZED			
29 FARMSTEADS, ROADS, DITCHES, DRAINS			
30 TOTAL AREA NOT IN IRRIGATION ROTATION (LINES 27 + 28 + 29)			
31 URBAN AND SUBURBAN RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL LANDS			
32 TOTAL IRRIGABLE AREA FOR SERVICE (LINES 26 + 30 + 31)	2.768		2.768
33 TOTAL IRRIGABLE AREA NOT FOR SERVICE			
34 TOTAL IRRIGABLE AREA (LINES 32 + 33)			2.768
35 CLASS 6--TEMPORARILY IRRIGATED			

CROP VALUE SUMMARY

41 GROSS CROP VALUE (FROM LINE 194)		273.549
42 ADDITIONAL REVENUE:		
43 FEDERAL ASCS PAYMENTS	TOTAL \$	
44 SUGAR PROGRAM:		
45 FACTORY \$	FEDERAL \$	TOTAL \$
45 TOTAL ADDITIONAL REVENUE		
46 TOTAL VALUE (GROSS CROP VALUE PLUS ADDITIONAL REVENUE)		273.549
47 TOTAL IRRIGATED ACREAGE (FROM LINE 24)		1.029
48 AVERAGE VALUE PER IRRIGATED ACRE (LINE 46 / LINE 47)		265.84

CROP PRODUCTION

ITEM	CROPS HARVESTED IN IRRIGATION ROTATION	ACRES	UNIT	YIELD PER ACRE	TOTAL	VALUE OF CROPS PER UNIT	PER ACRE	TOTAL
CEREALS								
51 BARLEY	BU							
52 CORN	20 BU		50	1,000	2.00	100.00	2,000	
53 OATS	BU							
54 RICE	CWT							
55 RYE	BU							
56 SORGHUMS (SORGO, KAFFIR, ETC.)	BU							
57 WHEAT	BU							
58 OTHER CEREALS	CWT							
59 TOTAL CEREALS	20 TON					100.00	2,000	
FORAGE								
61 ALFALFA HAY	540 TON		3.0	1,620	60.00	180.00	97,200	
63 OTHER HAY	33 TON		4.1	134	45.13	193.27	6,048	
64 IRRIGATED PASTURE	67 AUM		12.0	804	5.43	65.19	4,368	
65 CORN FORAGE	21 TON		7.0	147	13.92	97.43	2,046	
66 SILAGE OR ENSILAGE	13 TON		10.0	130	15.00	150.00	1,950	
67 CROP RESIDUE: WHEAT TOPS	TON							
68 STUBBLE, STALKS, ETC.	AUM							
69 STRAW (ALL KINDS)	TON							
70 ROOT CROPS (CARROTS, ETC.)	TON							
71 OTHER FORAGE	TON							
72 TOTAL FORAGE	674 TON					165.60	111,612	
MISC. FIELD CROPS								
81 BEANS, CANTON	CWT							
82 BEANS, DRY AND EDIBLE	CWT							
83 BROCCOLINI	TON							
84 COTTON, LINT (UPLAND)	BALE							
85 COTTON, SEED (UPLAND)	TON							
86 COTTON, LINT (AM. PIMA)	BALE							
87 COTTON, SEED (AM. PIMA)	TON							
88 HOPS	TON							
89 PEPPERMINT	LB							
90 SPEARMINT	LB							
91 SUGAR BEETS	TON							
92 SOYBEANS	BU							
93 OTHER MISC. FIELD CROPS	TON							
94 TOTAL MISC. FIELD CROPS	TON							

CROP PRODUCTION

ITEM	CROPS HARVESTED IN IRRIGATION ROTATION	ACRES	UNIT	YIELD PER ACRE	TOTAL	VALUE OF CROPS PER UNIT	PER ACRE	TOTAL
VEGETABLES								
101 ASPARAGUS	CWT							
102 BEANS (PROCESSING)	TON							
103 BEANS (FRESH MARKET)	CWT							
104 BROCCOLI	CWT							
105 CABBAGE	CWT							
106 CARROTS	CWT							
107 CAULIFLOWER	CWT							
108 CELERY	CWT							
109 CORN, SWEET (PROCESSING)	TON							
110 CORN, SWEET (FRESH MARKET)	91 CWT		35.1	3,192	8.50	298.15	27,132	
111 CUCUMBERS	CWT							
112 GREENS (KALE, ETC.)	CWT							
113 LETTUCE	CWT							
MELONS:								
114 CANTALOUPE, ETC.	CWT							
115 HONEY BALL, HONEYDEW, ETC.	CWT							
116 WATERMELONS	CWT							
117 ONIONS, DRY	CWT							
118 ONIONS, GREEN	CWT							
119 PEAS, GREEN (PROCESSING)	TON							
120 PEAS, GREEN (FRESH MARKET)	CWT							
121 PEPPERS (ALL KINDS)	105 CWT		77.4	8,126	15.44	1,194.86	125,460	
122 POTATOES, EARLY	CWT							
123 POTATOES, LATE	5 CWT		60.0	300	5.50	330.00	1,650	
124 SQUASH	CWT							
125 SWEET POTATOES	CWT							
126 TOMATOES (CANNING)	TON							
127 TOMATOES (FRESH MARKET)	CWT							
128 OTHER VEGETABLES	CWT							
129 TOTAL VEGETABLES	201 TON						767.37	154,242
137 TOTAL NURSERY	M							
SEEDS								
141 ALFALFA	CWT							
142 CLOVER (ALL KINDS)	CWT							
143 CORN	CWT							
144 FLAXSEED	CWT							
145 GRASS (ALL KINDS)	CWT							
146 LETTUCE	CWT							
147 ONION	CWT							
148 PEA	CWT							
149 POTATO (ALL KINDS)	CWT							
150 SUGAR BEET	CWT							
151 OTHER SEED	CWT							
152 TOTAL SEEDS	TON							
FRUITS								
161 APPLES	130 TON		2	32	152.34	37.50	4,875	
162 APRICOTS	2 TON		1.0	2	120.00	120.00	240	
163 BERRIES (ALL KINDS)	CWT							
164 CHERRIES	TON							
165 CITRUS: GRAPEFRUIT	CWT							
166 LEMON AND LIME	CWT							
167 ORANGES AND TANGERINES	CWT							
168 DATES	TON							
169 GRAPES, TABLE	1 TON		1.0	1	400.00	400.00	400	
170 GRAPES, OTHER	TON							
171 OLIVES	TON							
172 PEACHES	TON							
173 PEARS	1 TON		1.0	1	180.00	180.00	180	
174 PRUNES AND PLUMS	TON							
175 OTHER FRUITS	TON							
176 TOTAL FRUITS	134 TON						42.50	5,695
NUTS								
181 ALMONDS	TON							
182 PECANS	CWT							
183 WALNUTS	TON							
184 OTHER NUTS	TON							
185 TOTAL NUTS	TON							
191 FAMILY GARDENS AND ORCHARDS	VAL							
192 TOTAL ALL CROPS	1,029							273,549
193 LESS MULTIPLE CROPPED								
194 TOTAL HARVESTED CROPLAND AND PASTURE	1,029						265.84	273,549

III

STORAGE AND RIVER REGULATION

(Report to The Engineer Advisors Rio Grande Compact Commission)

1977 Presentation to Engineer Advisers

Rio Grande Compact Commission

San Juan-Chama Project

Daily Operation of Heron Reservoir

Computation of Rio Grande flow to be bypassed daily during calendar year 1977 was based upon records of Heron Reservoir and Azotea Tunnel Outlet. The daily change in reservoir content plus releases and net evaporation are used to compute total inflow to the reservoir. This total inflow minus the adjusted flow from Azotea Tunnel Outlet is assumed to be the natural inflow into the reservoir. At times, this computed inflow varied significantly from day to day or reflected a negative inflow. At these times, judgment was used in making releases by reviewing a 5- and 10-day moving average along with any known onsite conditions in an attempt to attain the natural flow conditions.

Monthly Computations of Reservoir Operation

At the end of each month, Heron Reservoir operation was computed according to details outlined in the San Juan-Chama Project's "Water Accounting and Operational Plan" dated March 18, 1974, as transmitted in the Regional Director's letter of March 19, 1974, to the Rio Grande Compact Commissioners.

Summary of Heron Reservoir Status

San Juan water releases from Heron Reservoir and monthly reservoir inflow and water storage computations for calendar year 1977 are shown on the attached tables 1, 2, 3, and 6.

It is still recommended that no releases be made during January and February. As soon thereafter as ice conditions permit, releases will be initiated. A significant drawdown of the reservoir water surface during these times may present hazardous conditions to ice fishermen and snowmobilers. If releases are made during these times, it will be necessary to restrict public access to the reservoir for a specified period after completing the release.

Pojoaque Tributary Unit

Nambe Falls reservoir operation was computed according to details approved by the Rio Grande Compact Commissioners in 1977. The only deviation from the procedures was that the weather station at Santa Fe College was used instead of a still to be installed weather station near Nambe Falls Reservoir.

A summary of the reservoir operation is shown on table 4 and the return flow credit from the Pojoaque Tributary Unit is shown on table 5.

San Juan Water at Otowi

San Juan water at Otowi is shown on table 7.

Summary of San Juan Water Storage

Status of San Juan water storage at end of month for all reservoirs, except Heron, is shown on table 8.

Elephant Butte Reservoir

During December 1977, release of 6,322 acre-feet from Heron Reservoir was made to deliver 6,000 acre-feet of San Juan water to Elephant Butte Reservoir. The 6,000 acre-feet is the maximum annual amount of delivery for replacement of evaporation loss on the permanent pool as provided in the authorizing legislation. As in previous years, a 5.1 percent total transportation loss from Heron Reservoir to Elephant Butte Reservoir was used to determine delivery during December.

1977

Table 1. Estimated apparent inflow to Heron Reservoir

(Rounded to nearest 10 acre-feet)

Month	Azotea Tunnel Outlet	Computed Channel Loss	Willow Creek above Heron Reservoir	Tributary Inflow above Heron Reservoir	1/ Computed Inflow to Heron Reservoir	Horse Lake Creek above Heron Reservoir	Tributary Inflow Within Heron Reservoir	Computed natural flow at Heron Dam (6+4+7 when +)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
January	60	30	30	0	310	0	280	280
February	70	10	60	0	70	0	10	10
March	50	0	140	90	-60	0	-200	90
April	4,540	30	4,510	0	4,460	0	-50	0
May	4,180	10	4,220	50	4,890	0	670	720
June	2,730	20	2,710	0	3,140	0	430	430
July	1,220	0	1,340	120	2,040	10	690	820
August	3,670	10	4,050	390	4,150	80	20	490
September	1,870	0	1,980	110	1,170	0	-810	110
October	880	0	940	60	460	0	-480	60
November	60	30	30	0	-290	0	-320	0
December	60	40	20	0	-290	0	-310	0
ANNUAL	19,390	180	20,030	820	20,050	90	-70	3,010

1/ Change in reservoir content plus releases plus water surface evaporation minus effective precipitation.

1977

Table 2. Willow Creek at Heron Dam

(Rounded to nearest 10 acre-feet)

Month	Natural flow above reservoir	Estimated natural flow at dam		
		Budget	Ratio	Recommended
January-----	0	280	0	280
February-----	0	10	0	10
March-----	90	90	220	220
April-----	0	0	0	0
May-----	50	720	120	720
June-----	0	430	0	430
July-----	130	820	320	820
August-----	470	490	560	490
September-----	110	110	270	270
October-----	60	60	150	150
November-----	0	0	0	0
December-----	0	0	0	0
ANNUAL-----	910	3,010	1,640	3,390

1977

Table 3. Monthly Water Storage--Upper Rio Grande Basin Projects--Heron Reservoir
(Rounded to nearest 10 acre-feet)

Month	Inflow		Outflow		San Juan Losses	End of Month Content			Elevation (feet)
	Rio Grande	San Juan	Rio Grande	San Juan		Rio Grande	San Juan	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dec.						-370	160,310	159,940	7134.23
Jan.	280	30	0	0	0	-90	160,340	160,250	7134.32
Feb.	10	60	0	0	0	-80	160,400	160,320	7134.34
Mar.	220	50	0	800	360	140	159,290	159,430	7134.08
Apr.	0	4,510	150	650	770	-10	162,380	162,370	7134.94
May	720	4,170	560	870	1,460	150	164,220	164,370	7135.52
Jun.	430	2,710	370	10,860	1,920	210	154,150	154,360	7132.57
Jul.	820	1,220	940	11,450	760	90	143,160	143,250	7129.13
Aug.	490	3,660	600	5,130	740	-20	140,950	140,930	7128.39
Sep.	270	1,870	40	8,420	1,030	210	133,370	133,580	7125.98
Oct.	150	880	300	5,490	1,080	60	127,680	127,740	7124.00
Nov.	0	30	130	200	360	-70	127,150	127,080	7123.77
Dec.	0	20	0	12,940	470	-70	113,760	113,690	7118.95
Adjustments <u>1/</u>					(-350)	-420	114,110	113,690	7118.95
Sub- Total	3,390	19,210	3,090	56,810	<u>2/</u>				
TOTAL	22,600		59,900		8,950				

1/ 353 acre-feet for year as per New Mexico Water Rights Files No. 1545 & No. 1699. Two acre-feet used for Heron Recreation and 351 acre-feet to replace evaporation losses.

2/ Includes 6,400 acre-feet net evaporation losses for the year.

1977

Table 4. Monthly Water Storage--Upper Rio Grande Basin Projects--Nambe Falls Reservoir

(unit = acre-feet)

Month	Inflow	Outflow		Reservoir Losses	Total Outflow & Losses	End of Month	
		By- passed	Storage Release			Content	Eleva- tion(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
December	-	-	-	-	-	612	6791.89
January	149	31	0	0	31	730	6796.35
February	130	28	0	0	28	832	6799.79
March	134	31	0	-1	30	936	6803.00
April	350	97	5	10	112	1,174	6809.35
May	726	698	395	11	1,104	796	6798.68
June	515	515	376	1	892	419	6783.19
July	320	306	42	-4	344	395	6782.01
August	395	229	25	-2	252	538	6788.86
September	356	271	7	1	279	615	6792.00
October	175	153	96	2	251	539	6788.88
November	188	99	81	3	183	544	6789.09
December	145	32	2	0	34	655	6793.57
TOTAL	3,583	2,490	1,029	21	3,540		

Heron Release for San Juan-Chama Storage at Nambe Falls Reservoir

Heron release required = (storage release + reservoir losses + change in content -
return flow credit, PVID)/0.98

$$= (1,029 + 21 + 43 - 216)/0.98 = 895 \text{ acre-feet}$$

Actual Heron release for Nambe Falls Reservoir during year = 895 acre-feet.

1977

Table 5. Return Flow Credit--Upper Rio Grande Basin Projects--Pojoaque Unit

(unit = acre-feet)

Month	1977 Release	Return Flow Credit in 1977												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Jan	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Mar	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	5	-	-	-	-	0.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	1.4
May	395	-	-	-	-	-	46.6	10.3	8.3	8.3	7.5	6.3	5.9	93.2
Jun	376	-	-	-	-	-	-	44.4	9.8	7.9	7.9	7.1	6.0	83.1
Jul	42	-	-	-	-	-	-	-	5.0	1.1	0.9	0.9	0.8	8.7
Aug	25	-	-	-	-	-	-	-	-	3.0	0.6	0.5	0.5	4.6
Sep	7	-	-	-	-	-	-	-	-	-	0.8	0.2	0.1	1.1
Oct	96	-	-	-	-	-	-	-	-	-	-	11.3	2.5	13.8
Nov	81	-	-	-	-	-	-	-	-	-	-	-	9.6	9.6
Dec	2	-	-	-	-	-	-	-	-	-	-	-	-	0
Total	1,029	-	-	-	-	0.6	46.8	54.8	23.2	20.4	17.8	26.4	25.5	215.5

1977

Table 6. San Juan Water Releases from Heron Reservoir

(unit = acre-feet)

Month	MRGCD	Elephant Butte	Santa Fe	Cochiti	City of Albuquerque	Nambe Falls	Chama Diverters	Department of Energy	Total
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	0	0	274	207	0	314	0	0	795
April	0	0	122	304	0	229	0	0	655
May	0	0	159	672	0	36	0	0	867
June	9,944	0	48	837	0	-20	0	0	10,859
July	10,906	0	99	490	0	-43	0	0	11,452
August	0	0	126	503	4,323	143	35	0	5,130
September	0	0	104	461	7,788	66	0	0	8,419
October	0	0	106	381	4,989	10	0	0	5,486
November	0	0	82	12	61	44	0	0	199
December	0	6,322	4,485	282	539	116	0	1,200	12,944
Total	20,900	6,322	5,605	4,149	17,700	895	35	1,200	56,606

1977

Table 7. San Juan Water at Otowi--Upper Rio Grande Basin Projects

(unit = acre-feet)

Month	SJ-C Release from Heron	Heron Release Stored in El Vado	El Vado Release from Storage	Total below El Vado	Release from Abiquiu	Losses <u>1/</u>	Users above Otowi <u>2/</u>	Return Flow Credit from Pojoaque Unit	San Juan at Otowi
Jan	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0
Mar	795	0	0	795	0	16	308	0	471
Apr	655	0	3,174	3,829	0	77	224	0	3,528
May	867	0	10,517	11,384	0	228	36	1	11,121
Jun	10,859	605	47,339	57,593	0	1,152	27	47	56,461
Jul	11,452	72	12,868	24,248	0	485	13	55	23,805
Aug	5,130	0	1,602	6,732	0	135	197	23	6,423
Sep	8,419	0	2,453	10,872	0	217	85	20	10,590
Oct	5,486	47	3,594	9,033	3,230	210	28	18	12,043
Nov	199	0	0	199	0	4	69	26	152
Dec	12,944	6,199	61	6,806	0	136	147	26	6,549
	56,806	6,923	81,608	131,491	3,230	2,660	1,134	216	131,143

1/ Channel Losses are 2% for releases from El Vado to Otowi and 0.9% for releases from Abiquiu.

2/ Users above Otowi includes a total of 1,093, 34 and 7 acre-feet for Pojoaque Tributary Unit, Chama Diverters, and effects of Public Service Company of New Mexico Buckman pumping respectively.

1977

Table 8. San Juan Water Storage--Upper Rio Grande Basin Projects--End of Month Contents

(Rounded to nearest 10 acre-feet)

Month	El Vado			Abiquiu			Narbe Falls		Cochiti			Elephant Butte		
	Elev. (feet)	Total Content (a.f.)	S.J. Content (a.f.)	Elev. (feet)	Total Content (a.f.)	S.J. Content (a.f.)	Elev. (feet)	Total Content (a.f.)	Elev. (feet)	Total Content (a.f.)	S.J. Content (a.f.)	Elev. (feet)	Total Content (a.f.)	S.J. Content (a.f.)
Dec.	6871.18	109,610	101,160	6150.94	25,080	25,010	6791.89	610	5321.31	47,560	47,480	4321.10	314,700	53,000
Jan.	6871.18	109,610	101,160	6150.92	25,060	25,010	6796.35	730	5321.23	47,470	47,470	4321.35	317,100	52,930
Feb.	6871.19	109,630	101,160	6150.93	25,070	25,010	6799.79	830	5321.19	47,420	47,420	4323.83	342,000	52,680
Mar.	6871.95	111,340	101,160	6150.88	25,020	24,910	6803.00	940	5321.17	47,390	47,390	4324.69	350,900	52,210
Apr.	6877.16	123,670	97,670	6150.73	24,860	24,660	6809.35	1,170	5321.58	47,890	47,500	4324.40	347,800	51,600
May	6869.81	106,580	86,590	6150.11	24,250	24,170	6798.68	800	5321.18	47,410	47,410	4320.03	304,500	50,780
Jun.	6840.39	54,330	39,350	6149.50	23,650	23,620	6783.19	420	5321.29	47,540	47,480	4310.41	219,500	50,100
Jul.	6826.57	36,350	26,420	6149.16	23,310	23,310	6782.01	400	5321.19	47,420	47,420	4298.68	136,100	49,220
Aug.	6817.04	26,140	24,700	6149.04	23,200	23,030	6788.86	540	5321.45	47,730	47,670	4296.06	120,900	48,560
Sep.	6814.33	23,560	22,250	6148.60	22,780	22,760	6792.00	620	5321.28	47,530	47,530	4296.55	123,600	47,820
Oct.	6809.99	19,720	18,600	6144.73	19,290	19,290	6788.88	540	5321.19	47,420	47,420	4297.27	127,800	47,230
Nov.	6809.99	19,720	18,590	6144.72	19,290	19,240	6789.09	540	5321.28	47,530	47,480	4300.66	148,300	46,720
Dec.	6817.33	26,430	24,650	6144.49	19,090	19,090	6793.57	660	5321.35	47,610	47,610	4305.50	181,400	52,360

510.2

1977

MAY 10 4 11 PM '77

751024 (11-77)
Bureau of Reclamation

Author: Typed Data

Blind Copy

E&R Center, Denver

IN REPLY
REFER TO: 220

510.2

TELETYPE

To: Commissioner, LBR, Washington, D.C.
Attention: 105

From: ACTING Director of Design and Construction, LBR, E&R Center,
Denver, Colorado

Subject: Interim Report of W. A. Wahler on Safety of Seven Bureau
of Reclamation Dams - Comments on Nambe Falls Dam - Pojoaque
Unit - San Juan-Chama Project, New Mexico
(Verbal Request of Assistant Commissioner of 5-12-77)

In response to Mr. Giampaoli's request that we furnish our position
with respect to concerns on Nambe Falls Dam raised in subject report
of May 10, 1977 to Assistant Secretary for Land and Water, we offer
our comments and planned action. We have also studied the reservoir
levels that may result from thunderstorms in the drainage area above
Nambe Falls Dam.

With respect to possible reservoir filling above previous storage
levels, we find that rather severe thunderstorms on top of the previous
maximum level will only cause an increase of about 3 feet.

Our detailed response to the other concerns is enclosed.

Stamp: MAY 23 1977
Stamp: REA
Stamp: 300

Enclosures

Copy to: Regional Director, Amarillo, Texas
Project Superintendent, Albuquerque, New Mexico
Chief, Division of Water O&M, E&R Center
Chief, Division of Planning Coordination, E&R Center

Reservoir Filling

We have routed five floods in order to determine their effects on reservoir filling. These floods are the 5- and 10-year frequency floods; the thunderstorm of August 8, 1967, which is considered an atypical, severe, short duration event; and the thunderstorms of July 21, 1949 and August 23, 1935 which are considered heavy thunderstorms for the area. The results of our routings are as follows:

<u>Storm</u>	<u>Maximum Reservoir Elevation</u>	<u>Duration Above Elevation 6809.47</u>
1. 5-year frequency	6809.59	16 hours
2. 10-year frequency	6811.17	9 days
3. August 8, 1967 thunderstorm	6809.75	5 hours
4. July 21, 1949 thunderstorm	6811.88	1 day, 4 hours
5. August 23, 1935 thunderstorm	6812.51	1 day

Top of active conservation storage is elevation 6826.6.

You will note that four of the five events are of very short duration. The maximum reservoir elevation for any event is 6812.51, which is only 3.04 feet above the reservoir elevation of April 29, 1977 (maximum elevation to date). Floods 3, 4, and 5 are the events that are most expected for the remainder of the year.

In addition to the above floods, reconnaissance grade routings were made of the 50-year and 100-year floods. Each flood was defined as a 3-day volume event. The results of these indicated that the reservoir levels would be elevation 6817.51 and elevation 6821.38 respectively for the 50-year and 100-year events.

It is our conclusion that none of these events will distress the dam and associated foundation in any way.

Spillway Operation

We have reviewed our assumptions on the effects of spillway discharge on the canyon walls and conclude that the original assumptions made early in 1973 are still valid. The spillway discharge was oriented to impact toward the right canyon wall away from the thrust block foundation (left canyon wall). Although we recognized some minor dislodgment might occur during spillway operation, the affected areas would not compromise either the foundation for the arch dam or its thrust block. For your information we are enclosing sketches that define the impact area for an average discharge and the discharge associated for the inflow design flood. The impact area is on solid granite. Although a jointed granite, a high degree of healing exists in the joint sets.

Floods that occur in the Rio Nambé watershed are characterized as short duration, low volume events. Spillway operation as a consequence also would be of short duration and would permit an early evaluation of the canyon walls and invert after spills.

Bureau of Reclamation Inflow Design Flood

During the May 5, 1977 meeting with W. A. Wahler and Associates (WAWA), Mr. Chuck Perry (WAWA) mentioned a hydrologic event cited in the publication "Handbook of Applied Hydrology" by Mr. Ven Te Chow. Mr. Chow discusses a flood that occurred on August 22, 1952 at El Rancho Arroyo, Pojoaque, New Mexico. The flood was listed as having a peak discharge of 44,600 ft³/s. Mr. Perry questioned why the Bureau had not used this event in its evaluation of the inflow design flood. Mr. F. A. Bertle (Bureau of Reclamation) stated that we had not used the particular event in question, but could not recall why it had been eliminated from consideration.

Subsequent to the meeting, Mr. Bertle contacted the United States Geological Survey (USGS) office in Santa Fe, New Mexico and was informed the data for the event cited in Mr. Chow's book are unreliable and consequently are not published in USGS hydrologic records.

On May 6, 1977, Mr. Noel Folsom, WAWA hydrologist, called Mr. Bertle and advised him that he, too, had contacted the USGS Santa Fe office and was told of the unreliability of the data published in Mr. Chow's book.

Faxogram - 4

Wahler and Associates also discussed in the May 5 meeting a heavy rainstorm (5.95 inches in 3 hours over 35 mi²) that occurred near Clayton, New Mexico. It was Wahler's assertion that this event should have been considered in the determination of the design storm for Nambe Falls damsite.

The Bureau of Reclamation recognized the Clayton, New Mexico storm and concluded that if it were maximized and transposed to the Nambe Falls drainage area, it would be less critical than the design storm actually used.

It is our conclusion that the Bureau's inflow design hydrograph for Nambe Falls damsite and the data used to develop the hydrograph are valid and justifiable and do not require any modification.

Additional Drainage of Foundation for Thrust Block

In the May 5, 1977 meeting with Wahler and Associates (WAWA), WAWA representatives discussed the beneficiation to be achieved from additional drainage of the thrust block foundation. Specifically, they suggested intermediate foundation drains drilled from the foundation gallery and horizontal drains drilled from the surface.

A review of flow measurement data from the foundation drain holes in the thrust block foundation shows that to date no flows have developed. Drilling of intermediate foundation drill holes from the gallery would not be justifiable.

Drilling of horizontal drain holes probably would be more productive; however, our review of uplift pressure pipe instrumentation indicates that the hydrostatic pressures are as anticipated. Accordingly, we can see no real justification for additional drainage at this time.

Thrust Block Design

The thrust block at Nambe Falls Dam is designed to behave as a monolithic structure. The contraction joints were keyed and grouted to ensure that all the blocks act as one structure. A two-dimensional gravity analysis of the thrust block provides a conservative estimate of the true behavior of a three-dimensional structure.

During the design studies for the thrust block, it was recognized that the thrust block acts three-dimensionally because of its geometry and applied loads. It was recognized that if the stresses

Faxogram - 4

and stability factors were reasonable as determined using the simpler two-dimensional gravity analysis that the structure would be safe.

It is reasonable to compare the computed stability factors and stresses with criteria developed for the gravity analysis as a guide upon which to make a decision concerning safety. It is unnecessarily conservative, however, to rigidly apply the criteria to results that do not totally reflect the three-dimensional effects. It is, therefore, incorrect to conclude that the thrust block was designed to less than state-of-the-art practice.

The thrust block at Nambé Falls Dam will be analyzed using three-dimensional finite element methods this fall as part of a structural behavior comparison study. In an attempt to indicate the three-dimensional effects, the following results were computed by superimposing stresses computed from two-dimensional studies performed in the longitudinal and transverse directions of the thrust block:

TABLE A

Elevation	Vertical Stresses (lb/in ²)			Shear Friction Factor of Safety (Q)
	Point A, Point B, Point C	US/DS Direction		
6750	- 4 + 90 +58	9.6		
6735	+16 +127 +75	8.6		

Nambé Falls Dam and thrust block was constructed with a concrete design mix that yields a minimum compressive strength of 4,000 lb/in². At the time Nambé Falls Dam was being designed, the required safety factors were 4.0 for the normal loading condition and greater than 1 for the maximum credible earthquake (MCE) event. Utilizing these factors, the maximum allowable compressive stresses would be 1,000 lb/in² and 4,000 lb/in² respectively for the normal (static) loading condition and the MCE (dynamic) loading condition.

Testing of concrete cores in direct tension from several Bureau of Reclamation dams indicated that the direct tensile strength of concrete is approximately 6 percent of the compressive strength. This means that the ultimate tensile strength of Nambé Falls concrete should be 240 lb/in². Since a safety factor of 4 is desired for the static

+ compression
- tension

Faxogram - 6

loading condition, the allowable tensile stress is 60 lb/in^2 and 240 lb/in^2 for the dynamic loading. An examination of the stresses in Table A and the stress contours shown on the enclosed sketch indicates that actual stresses in the thrust block are far below allowable limits for the static loading condition.

Including a two-dimensional pseudostatic analysis for horizontal earthquake only yields the following:

TABLE B

Elevation	Change in Vertical Stress (lb/in^2)			Total Shear Friction Factor of Safety (Q)
	Point A,	Point B,	Point C	US/DS Direction
6750	+21	-23	+ 7	7.6
6735	+37	-40	+18	6.6

When stresses from the MCE loading in Table B are combined with those from the static loading, points B and C remain in compression and the maximum tensile stress of 25 lb/in^2 occurs at point A. When this value is compared to the allowable tensile stress of 240 lb/in^2 it is readily apparent that the thrust block has a very large safety factor for this loading combination.

Using these results, the thrust block checks out safely and according to state-of-the-art practice.

Mr. Wahler and his staff, when in Denver, agreed that a pseudostatic analysis would be adequate for earthquake studies on Nambe Falls Dam because it is located in a relatively quiet seismic area. The area is shown as Zone 1 on the Seismic Zone Map in "Seismic Risk Studies in the United States," by Algermissen, S. T., Fourth World Conference on Earthquake Engineering, Santiago, Chile, Vol. I, 1969. The Maximum Credible Earthquake determined for the site is a Magnitude 5 located at a distance of 5 miles.

A pseudostatic analysis including all components of the earthquake will be finished by Wednesday, May 18, 1977.

+ compression
- tension

Faxogram - 6

Embankment Design

Regarding the concerns raised on the embankment portion of the dam, we offer the following:

1. "Although theoretically a zoned dam, there is no evidence that the dam will perform in that manner if there is any cracking of the core or excessive foundation contact seepage." - Wahler

Although Mr. Wahler feels that "design data and analyses are minimal and inconclusive that the dam will perform as expected," results of construction control testing and permeability tests on embankment materials support the design concept of a zoned embankment.

The earth material in the Zone 1 core of the embankment portion of Nambu Falls dam is a mixture of clay fines (average of 45 percent passing a 200-mesh sieve), sand and gravel. Plasticity indices ranged from 10 to 20 and the liquid limits ranged from 28 to 50. Permeability tests made on the core gave an average permeability of 0.5 ft/yr. It is felt, therefore, that the core material is a tough, impervious, erosion-resistant material capable of undergoing plastic deformation when stressed.

The Zone 2 material in the embankment is a mixture of silty (nonplastic) fines (average of 12 percent passing a 200-mesh sieve), sand, gravel, and cobbles. Permeability testing on samples of this material obtained during construction indicated an average permeability in the range of 50 to 60 ft/yr. The ratio of permeabilities of Zone 2 to Zone 1, therefore, is between 150 and 200.

In the event that a crack should develop in the core (considered to be a remote possibility), the downstream Zone 2 is massive enough and of the proper gradation to transmit seepage without allowing piping of the clay fines from the Zone 1 core.

2. Concerns that foundation preparation may be inadequate in some respects, particularly in the fault zone area. - Wahler

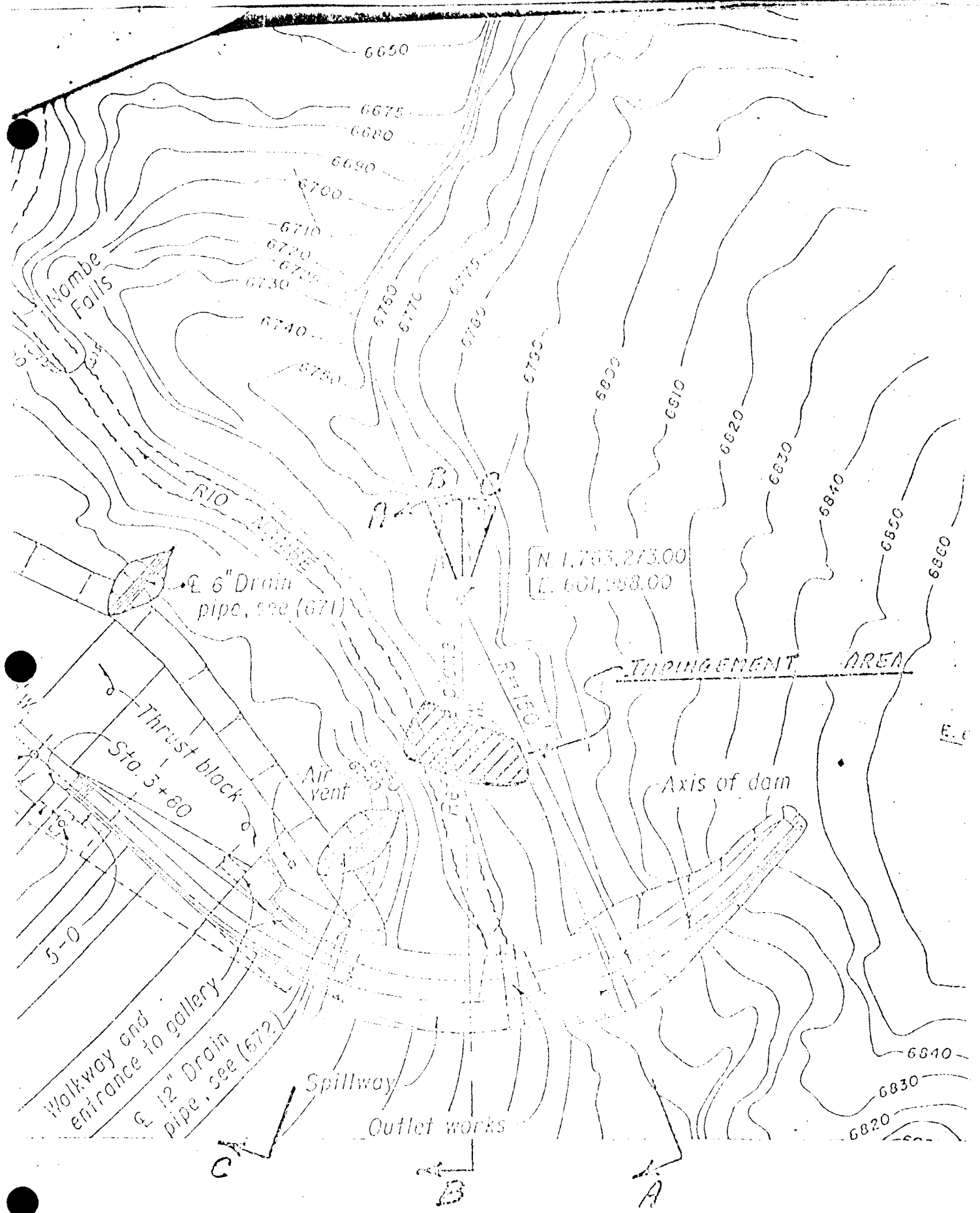
The installation of observation wells along the downstream toe of the dam is scheduled to begin on May 17. In addition, piezometers will be installed in the embankment and in the foundation to detect and measure water pressures during reservoir filling and subsequent reservoir operations.

3. "There are no backup safety features to the design of the dam." - Wahler

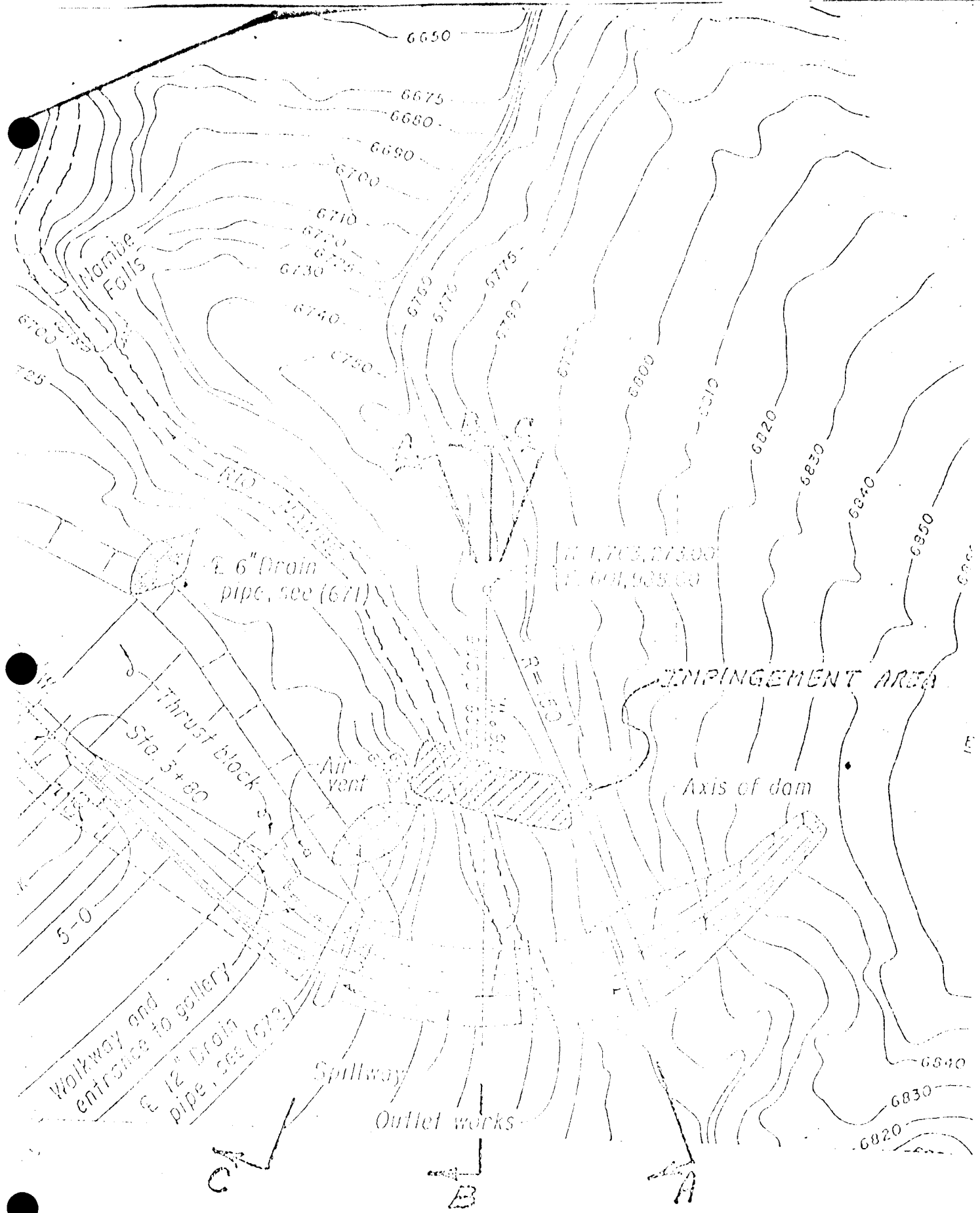
Except for the fault zone which we feel was adequately treated, the site did not pose unusual design problems. We believe that the dam is conservatively designed and that the earth materials within the dam will perform their functions as intended by the designers. The Zone 2 material, which is adjacent to the Zone 1 both upstream and downstream, would act as a backup feature should cracking occur in the Zone 1 core.

4. Additional materials testing and embankment stability analyses should be run, assuming that the dam performs as a homogeneous structure due to core malfunction overloading a relatively impervious shell. - Wahler

We have requested that samples of borrow materials be sent to Denver for laboratory testing. We will also obtain core samples from embankment zones and perform laboratory tests to confirm shear strength parameters assumed for design stability analyses. The stability analyses will be made using the parameters from laboratory testing and using the as-built dam configuration. The question with respect to zoning will also be addressed.



SCALE
1 INCH = 50 FEET



SCALE

1 INCH = 50 FEET

130

Faxogram - 10

NAMBE FALLS DAM
 IMPINGEMENT AREA
 AVERAGE SPILLWAY DISCH.

NAMEE FALLS DAM
SECTION C-C
(RADIAL SECTION AT LEFT
END OF SPILLWAY)

SCALE
1 INCH = 30 FEET

Max. W.S. El. 6839.8

W.S. El. 6823.7

Axis of dam

Max. discharge trajectory from inflow
design flood ($Q = 22,500$ c.f.s.)

Average spillway discharge
($Q = 1,100$ c.f.s.)

Max. W.S. El. 6829.8
Axis of dam

W.S. El. 6828.7

Max. discharge trajectory from inflow
design flood (90,000,000 cfs)

Average spillway discharge ($Q = 100,000$ cfs)

NAME FALLS DAM
SECTION B-B
(RADIAL SECTION ALONG REFERENCE)

SCALE
1 INCH = 30 FEET

Thrust Block Design

The thrust block at Nambé Falls Dam is designed to behave as a monolithic structure. During the design studies for the thrust block, it was recognized that the thrust block acts three-dimensionally because of its geometry and applied loads. However, it was also recognized that if the stresses and stability factors were reasonable as determined using the simpler two-dimensional gravity analyses that the structure would be safe. The thrust block at Nambé Falls Dam is scheduled this fall to be analyzed using three-dimensional finite element methods as part of a structural behavior comparison study. Earthquake analyses are being done on the thrust block and should be completed this month.

Embankment Design

Concerns have been raised about the embankment portions of the dam and the possibility of a homogeneous rather than a zoned dam. It is proposed to secure samples from embankment zones and from borrow areas, to perform laboratory tests on these samples, and to reanalyze stability using conservative values of materials properties as determined by new testing. However, control tests made during construction did confirm strength parameters assumed for design. The configuration for stability analyses will be that of the dam as constructed. This work has been initiated and should be completed in about 3 weeks. Also, piezometers will be installed to check foundation and embankment pore pressure. These are in addition to observation wells that are currently being installed under a contract awarded May 17, 1977, scheduled to be completed in 20 days. The seven observation wells will be located on the left abutment below the earth dam and will permit monitoring of any seepage along the toe of the dam.

Lack of Backup Safety Features

Our designers believe the dam to be conservatively designed, but as indicated above, plan to perform additional testing and analyses to confirm the safety of the dam as constructed. Except for the fault zone which we believe was adequately treated, the site did not pose unusual design problems. The addition of piezometers and observation wells together with careful monitoring during the initial filling should provide adequate information on the dam's performance.

We will advise you further as may be appropriate. The structure is being monitored daily and we plan to take all reasonable precautions until the safety of the dam is assured through further analyses and observation.

bcc: Director of Design and Construction
Regional Director, Amarillo, Texas

10358 JUN 21 77

IV

FINANCE

OPERATION AND MAINTENANCE SUMMARY COST REPORT

Sheet 1

Of 1

Office Upper Rio Grande Basin Projects UCRSP - San Juan Chama Part. Project Chama, New Mexico		Region SW		Date 9-30-77
FISCAL YEAR 19CY				
Program Item (1)	Approved Estimate		Actual Cost (4)	
	Original (2)	Revised (3)		
<u>COLLECTION AND DIVERSION ELEMENT</u>				
Heron Dam and Reservoir	90,000	20,000	18,582	
Recreation Management	7,000	7,000	1,272	
Diversion Works	83,000	60,455	26,533	
Canal and Conduit System	30,000	40,000	23,562	
Administrative and General Expense	85,000	168,450	144,247	
Water Accounting	-	-	41,614	
Replacements and Additions	<u>5,000</u>	<u>5,000</u>	<u>597</u>	
TOTAL OPERATION & MAINTENANCE COST	300,000	300,905	256,407	
Transfers, Credits and Other Expenditures	-	-	(659)	
Stores	<u>-</u>	<u>-</u>	<u>-</u>	
TOTAL EXPENDITURES	300,000	300,905	255,748	
Undelivered Orders	<u>-</u>	<u>-905</u>	<u>(235)</u>	
TOTAL OBLIGATIONS	300,000	300,000	255,513	
Methods of Financing:				
Upper Colorado River Basin Fund Revenue	37,000	37,000	27,280	
Funds Advanced by Waterusers	263,000	263,000	228,233	
Prepared by: <i>MD Brewer</i> Finance and Program Coordinator		Approved by: <i>[Signature]</i> Acting Projects Superintendent		Schedule Dated 8-1-76 Revised 11-8-76

BALANCE SHEET - CREDITS

PROJECT.

REGION SOUTHWEST AS OF Sep 30 77

ACCT NO.	TITLE OF ACCOUNT	SCH. NO.	BALANCE		INCREASE OR DECREASE
			Sep 30, 1977	Sep 30, 1976	
(1)	(2)		(3)	(4)	(5)
	LIABILITIES AND OTHER CREDITS				
	INVESTMENT OF U. S. GOVERNMENT				
	LESS REPAYMENTS AND CHARGE-OFFS				
200	FUNDS APPROPRIATED (EXCLUSIVE OF TRUST FUNDS)		73,527,580	72,948,671	578,909
203	UNLIQUIDATED CONTRACT AUTHORITY				
208	INTEREST DURING CONSTRUCTION CAPITALIZED		4,323,076	4,320,257	2,819
207	* INTEREST ACCRUED ON INVESTMENT		1,440,200	1,159,500	280,700
208	INTEREST DUE FROM THE UNITED STATES TREASURY (DR.)				
210	IRRIGATION ASSISTANCE PROVIDED BY OTHER GOVERNMENT AGENCIES				
212	TRANSFER OF COST OR PROPERTY (NET)		1,077,243	1,114,728	(37,485)
	TOTAL INVESTMENT OF U. S. GOVERNMENT		80,368,099	79,543,156	824,943
	LESS				
214	CHARGE-OFFS AS AUTHORIZED BY CONGRESS				
216	FUNDS RETURNED TO U. S. TREASURY		(2,100,972)	(1,453,535)	(647,437)
217	NONREIMBURSABLE EXPENSES (10)		(102,817)	(74,891)	(27,926)
	TOTAL REPAYMENTS AND CHARGE-OFFS		(2,203,789)	(1,528,426)	(675,363)
	NET INVESTMENT OF U. S. GOVERNMENT		78,164,310	78,014,730	149,580
	NON-FEDERAL INVESTMENT				
218	REPAYMENTS REALIZED FROM OTHER SOURCES				
219	REPAYMENT CONTRACTS - MATURED (6)		731,000	467,800	263,200
220	OTHER CHARGES FUNDED (DR.)				
221	INTEREST AND PENALTIES FUNDED (DR.)				
222	CONTRIBUTIONS (7)		4,968	4,968	-0-
	NET NON-FEDERAL INVESTMENT		735,968	472,768	263,200
	EXCESS OF INCOME OVER EXPENSE				
228	EXCESS OF INCOME OVER EXPENSE (11)		252,520	106,271	146,249
	CURRENT AND ACCRUED LIABILITIES				
232	ACCOUNTS PAYABLE (8)		47,429	58,811	(11,382)
242	DEPOSIT FUNDS - LIABILITIES		11,019	17,759	(6,740)
243	CREDIT DUE WATER USERS - OPERATING SURPLUS (12)		1,277	2,420	(1,143)
244	LIABILITY FOR ESCROW ACCOUNTS				
245	TRUST LIABILITIES				
	TOTAL CURRENT AND ACCRUED LIABILITIES		59,725	78,990	(19,265)
	OTHER CREDITS				
252	FACILITY USERS' ADVANCES FOR CONSTRUCTION				
253	OTHER DEFERRED CREDITS (9)		168,502	82,549	85,953
	TOTAL OTHER CREDITS		168,502	82,549	85,953
	TRANSFERS OF REPAYMENT OBLIGATIONS				
258	REPAYMENT OBLIGATIONS ASSUMED				
259	REPAYMENT OBLIGATIONS TRANSFERRED				
	NET TRANSFERS OF REPAYMENT OBLIGATIONS				
	RESERVES				
260	ALLOWANCE FOR DEPRECIATION				
261	ALLOWANCE FOR REPLACEMENT				
269	SPECIAL RESERVES				
	TOTAL RESERVES				
	TOTAL LIABILITIES AND OTHER CREDITS		79,381,025	78,755,308	625,717

BALANCE SHEET - DEBITS

PROJECT

REGION SOUTHWEST

AS OF Sep 30, 1977

ACCT NO.	TITLE OF ACCOUNT SCH. NO.	BALANCE		INCREASE OR DECREASE
		, 19	, 19	
(1)	(2)	(3)	(4)	(5)
	ASSETS AND OTHER DEBITS			
	PLANT PROPERTY AND EQUIPMENT			
101	MULTIPURPOSE PLANT	65,204,211	65,246,558	(42,347)
102	IRRIGATION PLANT			
103	ELECTRIC PLANT			
104	MUNICIPAL AND INDUSTRIAL WATER PLANT			
105	OTHER PLANT			
107	CONSTRUCTION WORK IN PROGRESS	12,602,330	11,994,956	607,374
108	INTEREST DURING CONSTRUCTION	4,194	1,375	2,819
109	NONREIMBURSABLE INVESTIGATION COSTS CAPITALIZED			
113	CAPITALIZED MOVABLE EQUIPMENT	221	9,303	(9,082)
114	OTHER PHYSICAL PROPERTY			
115	SERVICE FACILITIES	-0-	(40,460)	40,460
	TOTAL PLANT, PROPERTY AND EQUIPMENT (1)	77,810,956	77,211,732	599,224
	INVESTIGATION AND DEVELOPMENT COSTS			
116	INVESTIGATION COSTS			
117	TRANSITIONAL DEVELOPMENT COSTS			
	TOTAL INVESTIGATION AND DEVELOPMENT COSTS			
	OTHER LONG TERM ASSETS			
122	REHABILITATION AND BETTERMENT CONTRACTS			
123	POWER RIGHTS			
124	LOANS			
125	DEFERRED AND UNMATURED RECEIVABLES			
	TOTAL OTHER LONG TERM ASSETS			
	CURRENT AND ACCRUED ASSETS			
131	CASH AND AVAILABLE FUNDS	1,514,366	1,505,586	8,780
134	DEPOSIT FUNDS	11,019	17,759	(6,740)
135	ESCROW ACCOUNTS			
140	DUE FROM WATER USERS - OPERATING DEFICIT			
142	ACCOUNTS RECEIVABLE (2)	25,344	97	25,247
147	ESTIMATED APPROPRIATION TRANSFERS			
154	STORES			
165	PREPAYMENTS AND ADVANCES	18,091	18,091	-0-
	TOTAL CURRENT AND ACCRUED ASSETS	1,568,820	1,541,533	27,287
	DEFERRED CHARGES AND OTHER DEBITS			
179	OTHER WORK IN PROGRESS			
180	RETIREMENT WORK IN PROGRESS			
182	EXTRAORDINARY LOSSES ON PROPERTY			
184	CLEARING ACCOUNTS			
186	MISCELLANEOUS DEFERRED DEBITS (4)	1,249	2,043	(794)
188	RETIREMENT DEDUCTIONS AND CONTRIBUTIONS			
	TOTAL DEFERRED CHARGES AND OTHER DEBITS	1,249	2,043	(794)
	TOTAL ASSETS AND OTHER DEBITS	79 381 025	78 755 308	625 717

COLUMNAR
SCHEDULETITLE EXCESS OF INCOME OVER EXPENSESan Juan Chama PROJECT, New Mexico REGION SW

	DESCRIPTION	Fiscal Year to Date			
		Sept. 30, 1977	Sept. 30, 1976	June 30, 1976	
225	<u>Excess of Income Over Expense</u>				
22550	Net Water Rental & Sales Income Pending Distribution				
	Beginning of Period	27,592	27,592	27,592	
	Net Income Current Period	0	0	0	
	Balance	27,592	27,592	27,592	
22560	Net Misc. Income Pending Distribution				
	Beginning of Period	78,420	70,157	70,157	
	Prior Year Adjustment		(933)	(933)	
	Net Income Current Period	146,210	9,196	9,196	
	Balance	224,630	78,420	78,420	
22570	Net Income Not Creditable to Repayment of Construction Costs				
	Beginning of Period	259	259	259	
	Net Income Current Period	39	0	0	
	Balance	298	259	259	
	Total Account 225	252,520	106,271	106,271	

TITLE EXCESS OF INCOME OVER EXPENSESCHEDULE NO. 11
DATE Sept. 30, 1977
SHEET 1 OF 1

BUREAU OF RECLAMATION

COLUMNAR
SCHEDULETITLE Summary of Income and Expense - IrrigationSan Juan Chama PROJECT, New Mexico REGION SW

	DESCRIPTION	Fiscal Year to Date			
		This Year	9/30/76	Last Year	
46000	<u>Operating Income</u>				
	Earned Advances	65,845	15,530	67,098	
46100	<u>Operating Expense</u>				
	Multipurpose Expense Assigned	(66,143)	(15,578)	67,757)	
	Net Income	(298)	(48)	(659)	
	Transferred to 243 - Credit Due Water Users	(298)	(48)	(659)	

TITLE Summary of Income and Expense - IrrigationSCHEDULE NO. 13
DATE Sept. 30, 1977
SHEET 1 OF 1

COLUMNAR
SCHEDULETITLE Summary of Income and Expense - M&ISan Juan Chama PROJECT, New Mexico REGION SW

	DESCRIPTION	Fiscal Year to Date			
		This Year	9/30/76	Last Year	
470	O&M Assessment				
	Total M&I Operating Income	162,600	35,925	156,256	
		162,600	35,925	156,256	
471	Multipurpose Expense-City of Albuquerque				
	Total M&I Operating Expense	162,600	35,925	156,256	
		162,600	35,925	156,256	
	Net Operating Income Pending Distribution	0	0	0	

TITLE Summary of Income and Expense - M&ISCHEDULE NO. 16
DATE Sept. 30, 1977
SHEET 1 OF 1

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMNAR
SCHEDULE

TITLE Summary of Nonoperating Income and Expense

San Juan Chama PROJECT, New Mexico REGION SW

	DESCRIPTION	Fiscal Year to Date		
		This Year	9/30/76	Last Year
49020	Sale of Water	146,070	0	0
49030	Sale of Land	140	0	9,196
	Net Sales	146,210	0	9,196
494	Miscellaneous			
49410	Income	0	0	0
49420	Expense	0	0	0
	Net Miscellaneous	0	0	0
495	Penalties and Forfeitures			
49510	Interest and Penalties	39	0	0
	Net Penalties and Forfeitures	39	0	0
	Net Nonoperating Income and Expense	146,249	0	9,196
	Transferred to:			
22550	Net Water Rental & Sales Income Pending Distribution	0	0	0
22560	Net Miscellaneous Income Pending Distribution	146,210	0	9,196
22570	Net Income Not Creditable to Repayment of Project Construction Costs	39	0	0
		146,249	0	9,196

TITLE Summary of Nonoperating Income and Expense

SCHEDULE NO. 20
DATE Sept. 30, 1977
SHEET 1 OF 1