

**NAVAJO GALLUP WATER SUPPLY PROJECT**  
**APPRAISAL LEVEL DESIGNS AND COST ESTIMATES**  
**APPENDIX G**  
**MONCISCO RESERVOIR AND NIIP OPERATIONS**

**NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION**

**ENGINEERING AND COST ESTIMATE  
APPRAISAL LEVEL REPORT**

**UNITED STATES DEPARTMENT OF INTERIOR  
BUREAU OF RECLAMATION  
FARMINGTON CONSTRUCTION OFFICE**

February 2002

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## A. Purpose and Objective

The purpose of this document is to provide appraisal level cost estimates for features of the Navajo Gallup Water Supply Project (NGWSP) that use the Navajo Indian Irrigation Project (NIIP) conveyance system. Several NGWSP alternatives propose the use of specific NIIP features for conveyance of NGWSP water. This document will focus on those features and the potential effects of the NIIP operations on these features and the costs associated with the Operations, Maintenance, and Replacement. This document will supplement the design and costs estimates for NGWSP performed by the Technical Service Center (TSC) and shall be an appendix to the TSC report.

This document discusses the proposed Moncisco Reservoir design, costs, and impacts on the NIIP operations from Navajo Reservoir to Burnham Lateral (NIIP Moncisco Alternative), the proposed use of the NIIP system from Navajo Reservoir to the Coury Lateral (NIIP Coury Alternative), the proposed use of the NIIP system from Navajo Reservoir to Cutter Dam (NIIP Cutter Alternative) and the proposed use of the NIIP system from Navajo Reservoir to the end of the Amarillo Canal (NIIP Amarillo Alternative).

## B. Background

### 1. Navajo Gallup Water Supply Project

Over the past 28 years several proposals have been studied to deliver water from the San Juan River and other sources of water to communities in the Navajo Nation and to the City of Gallup. Reclamation's first investigation for the "Gallup Project, New Mexico" culminated in a reconnaissance report dated October 1973. A second study was completed in January 1984 and included expanded service to Navajo communities as well as to the City of Gallup. An appraisal-level estimate for a system having a main transmission line along Highway 371 was completed in September 1986. In November 1993, an appraisal-level study was conducted to deliver water from Gallegos Reservoir, a planned feature of the Navajo Indian Irrigation Project (NIIP).

The present proposal for the Navajo Gallup Water Supply Project (NGWSP) serves the New Mexico portion of the Navajo Nation south of the San Juan River, the Navajo Nation in the Window Rock area within Arizona, the Jicarilla Apache Nation, and Gallup, New Mexico. A municipal water supply is needed in these areas to improve the standard of living for current and future populations and to support economic growth of the Navajo Nation, the Jicarilla Apache Nation and the City of Gallup. The NGWSP has evolved as a major infrastructure initiative to supply approximately 23,900 acre-feet (2020) or approximately 37,800 acre-feet (2040) of municipal water annually to meet these needs. To achieve this initiative, the following organizations are working closely in a cooperative effort: the Navajo Nation Department of Water Resources, the Jicarilla Apache Nation, Northwest New Mexico Council of Governments, City of Gallup, Bureau of Indian Affairs, New Mexico State Engineer, and the Bureau of Reclamation. A detailed history and explanation of the project can be found in the final draft of

“Technical Memorandum, The Navajo-Gallup Water Supply Project”, March 16, 2001, prepared by the Navajo Nation Department of Water Resources.

Moncisco Reservoir design began as an alternative in the “Gallegos Dam, Reconnaissance Design Summary” as a proposed NIIP feature and was further analyzed in “Water Supply and Storage Options”.

## 2. Navajo Indian Irrigation Project

The NIIP project was authorized for construction under Public Law 87-483 and was authorized as a participating project of the Colorado River Storage Project with the purpose of furnishing irrigation water to 110,630 acres of land. The project is being developed solely for Navajo use on lands that lie on or adjacent to the Navajo Reservation in fulfillment of a national obligation to the Navajo Nation. The act authorized the annual diversion to 508,000 acre-feet of water from Navajo Reservoir.

The project is authorized as a Bureau of Indian Affairs (BIA) project to be constructed under Indian laws. The project is designed for full sprinkler irrigation with eleven blocks approximately 10,000 acres each. The water is conveyed to the project lands through a system of canals, tunnels, and siphons. Navajo Reservoir was constructed specifically for the NIIP project but finds multiple uses at the present. The Main Canal, Gravity Main Canal, and Amarillo Canal range in capacity from 1,800 to 170 cubic feet per second (cfs) with a combined length of 71.4 miles consisting of 48.8 miles of concrete lined canal, 1.2 miles of plastic membrane lined canal, 12.8 miles of tunnels, 7.1 miles of siphons, and a 1.5 mile long channel and in-line reservoir formed behind Cutter Dam.

### C. Introduction

All of the alternatives currently proposed for the NGWSP would use portions of the NIIP system to supply all or part of the water for the project. The NIIP alternatives full supply of water would come from the NIIP system and Navajo Reservoir. The NIIP Moncisco Alternative (Drawing 1695-529-7) would use the NIIP system from Navajo Reservoir to Burnham Lateral where water would be diverted through an existing wasteway into Moncisco Wash which would supply the proposed Moncisco Reservoir. The NIIP Coury Alternative (Drawing 1695-529-9) would be supplied from Navajo Reservoir through the NIIP system to the start of the Coury Lateral where it would be diverted through a proposed BOR standard canal turnout. The NIIP Cutter Alternative (Drawing 1695-529-8) would use the existing Cutter Reservoir River outlet works to divert water into a proposed water treatment plant. The NIIP Amarillo Alternative (Drawing 1695-529-11) would be supplied from Navajo Reservoir through the NIIP system and diverted at Cutter Reservoir and at the end of the Amarillo Canal.

The NIIP system was analyzed to convey the year 2020 demand of 23,928 and year 2040 demand

of 37,764 acre feet per year for NGWSP in addition to the full supply for the NIIP. The NIIP alternatives are shown on Drawing 1695-529-12.

#### D. Moncisco Reservoir

Moncisco Reservoir is a proposed feature of the NIIP Moncisco Alternative for the NGWSP. Moncisco Reservoir is required to store water for the NGWSP during the non-irrigation season when the NIIP system is not operating. The current design of Moncisco Reservoir is based on previous designs from the Technical Service Center in Appendix F and the Farmington Construction Office report in Appendix G.

#### Design Considerations

Moncisco Reservoir is a planned feature of the NGWSP. The proposed dam would be located on Moncisco Wash approximately 4,200 feet upstream of the confluence with the West Fork of Gallegos Wash. Moncisco Reservoir would be supplied with water conveyed through the NIIP system starting at Navajo Reservoir, on the Main Canal to Gallegos Pumping Plant which supplies Burnham Lateral and through an existing wasteway into Moncisco Wash. Moncisco Wash is proposed to be a stabilized channel (Appendix G).

Geological investigations have not been conducted at the Moncisco Dam site except for a reconnaissance grade visual inspection. Previous geological investigations were conducted at a site approximately 4,200 feet from Moncisco and can be found in Appendix F. Based on the proximity of the investigations to Moncisco Dam, assumptions as to the geology were formulated by the Technical Service Center (Appendix F). Our estimate assumes depth to competent foundation to be 20 feet from existing ground below elevation 5980 and 10 feet for elevations above 5980. Geological investigations would be required at the Moncisco Wash site in the next level of investigations and design.

Moncisco Dam is assumed to be an earthen dam with a crest width of 30 feet, embankment slopes of 3:1 (Horizontal:Vertical) upstream and downstream, and a 100 foot wide uncontrolled ogee crest spillway. The upstream slope would be protected by 10 feet of soil cement. A sand filter and gravel blanket are included to control seepage and provide protection from piping of embankment and foundation materials. The outlet works would be a standard BOR Class III structure. Drawing 1695-529- 13 shows the plan, profile, and sections of Moncisco Dam and drawing 809-D-4583 shows the outlet works and spillway.

The 100 foot wide uncontrolled ogee spillway was designed for a probable maximum flood (PMF) of 48,600 ft<sup>3</sup>/s and a 24 hour volume 9,100 acre-feet. The normal water surface elevation for year 2020 is 6023 and 6032 for year 2040. The maximum water surface elevation is 6035 and 6042 for year 2020 and 2040 respectively. A standard USBR Type III stilling basin would be located approximately 13 feet below the ground surface at the end of the spillway. The stilling basin would be 70 feet long by 80 feet wide.

The outlets works would be located on the left abutment of the dam. The outlet works would have a trash rack intake structure, 66 inch diameter upstream steel lined conduit, high pressure slide gate, and downstream 66 inch diameter steel line pipe inside of a 10 foot diameter horseshoe shaped conduit. The horseshoe shaped conduit is required for access to the gate and gate structure.

Dam material quantities were based on the above assumptions for depth to bedrock and the increased capacity of the reservoir with a dam crest at elevation 6040 and 6047. Five feet of free board is assumed for both capacities. The quantities for the dam materials are shown in Appendix B.1.

The operational capacity for Moncisco Reservoir was determined based on the operations of the NIIP, length of the NIIP yearly operations, and the NGWSP demand . It is assumed that the NIIP system would be operated from March 1 through October 14 during the irrigation season. Storage is required during the non-irrigation season to supply the demand for the NGWSP. The demand pattern for the NGWSP was assumed to be the same as the existing demand pattern for Navajo communities that are currently serviced by the Navajo Tribal Utility Authority (NTUA). The demand pattern for NGWSP is found in Appendix B.2.

The capacity of the NIIP system was studied in 1995 specifically for the planned Gallegos Reservoir by Keller-Bliesner Engineering and a report in Appendix H discusses the findings that were generated. The report showed excess capacity in the NIIP system, and the limiting reach of the canal system for supplying water to Moncisco Reservoir is the Burnham Lateral. The report used the highest historical water use crop mix to determine demand for the NIIP. The 1982 crop mix with the 1959 climate was used to determine the maximum evapotranspiration (ET) for the NIIP. These ET rates were updated in 2000 by Keller-Bleisner Engineering (Appendix H.1) and used in this study to determine the NIIP demand and water available for the NGWSP. The NGWSP spreadsheet in Appendix B.3 shows the required size for Moncisco Reservoir based on the NIIP ET rates, The NIIP capacity, the NGWSP demand, reservoir losses, and dead storage for the two demand periods. It is assumed that the NIIP has a 90 percent conveyance efficiency as discussed in the Keller Bleisner report and verified using existing NIIP operation data (Appendix B.6). Major losses in the reservoir are through seepage and evaporation. The value for seepage used was the same value as assumed by the TSC (Appendix F). Evaporation losses were determined by using the historical evaporation rates for Navajo Reservoir (Appendix B.4) which is located in the same geographical area and has similar climate and temperature.

The time period in which the NIIP canal system does not supply water determined the size of Moncisco Reservoir. An extended period of the NIIP system operation would decrease the required size of Moncisco Reservoir, but no analysis was done to quantify the decrease. Maintenance on the NIIP conveyance system occurs during the non-irrigation season and Moncisco Reservoir was designed to minimize impacts to the NIIP operations and maintenance.

The estimated construction costs for Moncisco Dam are \$69.4 million in year 2040 and \$61.7

million in year 2020 which includes dam materials, spillway, outlet works, mitigation and relocation of utilities, channel stabilization, mobilization, unlisted items, and contingencies. October 2001 pricing level was used for the Moncisco Reservoir estimate (Appendix B.5). This estimate differs from the TSC report (Appendix F) due to the addition of channel stabilization, and mitigation and relocation of utilities which were indexed from the FCO report (Appendix G). Mitigation of utilities includes capping of gas wells and restitution for loss of production.

The current estimate had larger quantities required than the TSC report because of the assumptions made as to the depth to competent foundation. Discussions with the Farmington Construction Office geology group indicate that the assumed depth to competent foundation is reasonable and prudent for this appraisal level study. Depth to competent foundation should be verified in next level of investigations. No discussions have been conducted with the Navajo Agriculture Products Industry (NAPI), the operating entity of the NIIP, as to their willingness to extend the irrigation season.

#### E. NIIP Winterization

To take advantage of the existing NIIP system, three NGWSP alternatives propose the use of the NIIP system on a year round basis. The NIIP Coury alternative would use the NIIP system to supply water from Navajo Reservoir through Cutter Reservoir, in the Main Canal to Kutz Pumping Plant and into the Coury Lateral where it is diverted, treated and conveyed to the required delivery locations. The NIIP Cutter Alternative would use water supplied from Navajo Reservoir to Cutter Reservoir where it is diverted, treated and conveyed in a pipeline to the points of delivery. The NIIP Amarillo Alternative would use the NIIP canals from Navajo Reservoir to the end of Amarillo Canal where it is diverted for NGWSP. The construction costs for the NGWSP features of these alternatives were provided by the TSC. This report is included as an appendix to main report (Navajo Gallup Water Supply Project, Appraisal Level Design and Cost Estimates).

There are Operations and Maintenance (O&M) costs associated with the use of the NIIP canal system as well as costs associated with winterizing the canal to provide water on a year round basis. The winterization costs for the NIIP Coury Alternative are \$312,000 (Appendix D.1), the NIIP Cutter Alternative costs are \$62,400 (Appendix C.1), and the NIIP Amarillo costs are \$785,000 (Appendix E.1). Winterization costs increase with the length of the NIIP canal system usage.

Winterization of the canal system is required for protection against the effects of freezing of mechanical equipment. It was assumed that the canal would be operated at a level sufficient to provide for a top layer of ice with free flowing water below. To accomplish this type of pool the canal would be checked at existing check structures. All gates at pumping plants or structures such as checks or wasteways used during winter operations would require complete replacement with structures capable of winter operations. Other structures or turnouts not to be used for operations would be sealed appropriately to prevent damage to mechanical equipment and

structures. The NIIP Coury Alternative would require new gates and gate seals at seven check structures, Kutz Pumping Plant and at Cutter Reservoir headworks. Only the gates at Cutter headworks require winterization in the NIIP Cutter Alternative since the NIIP system from Navajo Reservoir to Cutter Reservoir is mainly tunnels and will not be affected by cold weather conditions. The NIIP Amarillo Alternative would require new gates at Cutter headworks, at 4 wasteway structures and 17 check structures and the sealing of 43 pumping plant turnouts. Unit costs for the NIIP winterization were obtained from a previous specification (Winterize Canal Structures, 1999) to winterize several canal structures on the NIIP to supply water for a proposed French Fry Plant. Bids were received for the proposed winterization. Winterization was not performed on the NIIP system because the proposed French Fry Plant was not constructed, which would require winter operations.

Effects of winter use on the canal lining and other concrete structures were not considered. Maintenance by NAPI on the NIIP conveyance system normally occurs during the non-irrigation season. Scheduled or required maintenance of the NIIP canal system has not been fully researched; therefore, the potential impacts to The NIIP/NAPI operations and maintenance during the winter are not discussed.

#### F. Operation and Maintenance Costs

The NIIP conveyance costs for canal O&M are estimated using a BOR program and a cost index provided by TSC for O&M. The indexes are found by using historical data from existing BOR projects and provided by the TSC in a yearly publication. The program estimating the costs for the NIIP assumes the utilization of the full capacity of the conveyance system. The program outputs for the O&M costs associated with the canal for each NIIP alternative are shown in the Appendices.

Table 1 has the yearly operations and maintenance and replacement costs for the NIIP alternatives. Canal O&M includes tunnels, siphons, and lined canals and Pumping Plant O&M which includes energy costs and maintenance. There is cost sharing between the NIIP and the NGWSP for O&M on the portions of the NIIP system used by the NGWSP. The NGWSP portion for Canal O&M is assumed to be a ratio of the NGWSP demand of 67cfs in year 2040 and 43cfs in year 2020 to the design capacity of the canal reach. Currently the NIIP canal system is operated between 600 - 700 cfs, but as development increases the demand, the canal system will reach a maximum of 1800 cfs. The canal system is currently operated with checks to maintain the canal at the designed operating depth.

Example of Canal Proportioning:      Canal Capacity 1800 cfs  
Year 2040  
NGWSP Demand 67 cfs  
Proportion = 67/1800

Example of Canal Proportioning:      Canal Capacity 1800 cfs  
Year 2020  
NGWSP Demand 43 cfs  
Proportion = 43/1800

The NIIP Amarillo Alternative differs in the proportioning because this alternative diverts water at Cutter Reservoir and at the Amarillo Canal; therefore, the total NGWSP demand is not proportioned beyond Cutter Reservoir.

Operations, maintenance and replacements costs are calculated for the NIIP Pumping Plants used for NGWSP conveyance. These costs are determined by a BOR estimating program called "PMPOM" and the results are in the Appendices. Pumping Plant O&M is proportioned by comparing the costs of pumping with and without the addition of NGWSP to the NIIP diversion volume. The NGWSP will bear the full costs of pumping during the non-irrigation season. The total cost for NGWSP for O&M is the non-irrigation season costs and the proportioned costs. Replacement costs were proportioned using the NGWSP demand compared to the design capacity of the pumping plant (similar to canal O&M). The NIIP Coury Alternative through Kutz Pumping Plant and the NIIP Moncisco Alternative through Gallegos Pumping Plant are the only alternatives that use the NIIP pumping plants for conveyance.

Table 1. Operations, Maintenance, and Replacement costs for NGWSP alternatives using portions of the NIIP conveyance system for year 2020 and 2040.

	NIIP Cutter	NIIP Coury	NIIP Moncisco	NIIP Amarillo
Winterization construction cost	\$48,000	\$240,000	\$0	\$603,600
Canal O&M per year 2020	\$34,500	\$43,400	\$55,600	\$69,300
Canal O&M per year 2040	\$36,400	\$50,200	\$69,300	\$91,300
Pumping Plant O&M (conveyance) 2020 per year	\$0	\$35,200	\$5,900	\$0
Pumping Plant O&M (conveyance) 2040 per year	\$0	\$43,500	\$9,000	\$0
Pumping Plant Replacement 2020 per year	\$0	\$13,300	\$6,500	\$0
Pumping Plant Replacement 2040 per year	\$0	\$13,300	\$6,500	\$0
Pumping Plant Energy@.8.1 mil/KWH and 3.44 per KWH demand charge 2020 per year	\$0	\$237,900	\$86,900	\$0
Pumping Plant Energy@.8.1 mil/KWH and 3.44 per KWH demand charge 2040 per year	\$0	\$293,700	\$137,100	\$0

Note:

1. Winterization includes installation of new gates and structures at check structures, wasteways and other gates required for canal operation and pumping plant turnout sealing.
2. Winterization costs do not have mobilization, unlisted items, or contingencies applied to the cost.
3. Canal O&M is proportioned by using the canal capacity with the NGWSP capacity. Also a canal operators wages (\$31,200 per year) are included for canal operations of equipment etc.
4. Pumping Plant O,M,& E is the difference of Pumping Plant operations costs with and without NGWSP diversion requirements. Replacement costs are proportioned by the pumping plant capacity to NGWSP maximum flowrate.
5. The NIIP Coury Pumping Plant (Kutz) operates all year round, therefore the full costs of O,M&R for non irrigation season is the responsibility of NGWSP. Also NGWSP (Kutz) uses a larger portion of the plant capacity 67/200 as compared to The NIIP Moncisco Pumping Plant (Gallegos 67/880).

## G. NIIP Operational Models

Operational models were created for all the NIIP alternatives to demonstrate that the canal system was capable of supplying NGWSP demand and to determine any additional requirements required for the supply. The limiting reach for each NIIP alternative was identified and analyzed for capacity. The operational models assume that the full capacity of the NIIP system is utilized. The evapotranspiration rates identified by Keller Bleisner Engineering (Appendix H.1) were used with the downstream acreage of the limiting reach to determine the NIIP demand. The NIIP downstream acreage demand in the limiting reach includes conveyance efficiency and crop application efficiency of 90 and 75 percent respectively. The limiting reach in each of the NIIP alternatives coincidentally is the reach where water is diverted for the NGWSP.

The NIIP Cutter Alternative was not modeled because the NIIP system upstream of Cutter has sufficient capacity (1,800cfs) for NGWSP demand. It was assumed that Cutter can be used for some storage and winter operations.

The NIIP Coury Alternative limiting reach was the Coury Lateral with a capacity of 200 cfs and downstream acreage of 9,662. A maximum 34 percent of the capacity of the Coury Lateral is required by NGWSP. This alternative proposes operations throughout the entire year. During specific summer months when the NIIP demand is high there is not enough capacity in the system to provide for the NGWSP demand. Storage ponds with 4,100 and 1,400 acre feet of storage for year 2040 and 2020 are required to provide for NGWSP demand during periods when the Coury Lateral does not have the capacity to provide both the NIIP and the NGWSP demands.

The NIIP Amarillo Alternative limiting reach is the end of Amarillo Canal with a capacity of 170 cfs and a downstream acreage of 8,455. This alternative has two locations for diversion, one at Cutter Reservoir and the other at the end of the Amarillo Canal; therefore, the full demand of the NGWSP is not supplied through the Amarillo Canal. This alternative also proposes year round operations. Storage ponds with 4,300 and 1,800 acre feet of storage for year 2040 and 2020 are required to provide for the NGWSP demand during periods when the Amarillo Canal does not have the capacity to provide both the NIIP and the NGWSP demands.

The NIIP Moncisco Alternative is different from the other alternatives because it uses the NIIP system only during the existing irrigation season which is from March 1 through October 15. This alternative also requires storage for the NGWSP in the form of Moncisco Reservoir and the model is discussed above.

## H. List of Appendices

Appendix A - Figures and Drawings

Appendix B - Moncisco Reservoir

B.1 - Moncisco Dam Quantities

B.2 - NTUA Demand Pattern

B.3 - NIIP Moncisco Operations Model

B.4 - Navajo Reservoir Evaporation Rates

B.5 - Moncisco Cost Estimates

B.6 - NIIP Conveyance Efficiency

B.7 - Moncisco Reservoir Capacity Curve

B.8 - NIIP Moncisco Alternative, O&M Costs

B.9 - Burnham Lateral Wasteway Capacity

Appendix C - NIIP Cutter Alternative

C.1 - NIIP Cutter Alternative, O&M Costs

C.2 - NIIP Cutter Alternative, Winterization Costs

Appendix D - NIIP Coury Alternative

D.1 - NIIP Coury Alternative, Operational Model

D.2 - NIIP Coury Alternative, O&M Costs

D.3 - NIIP Coury Alternative, Winterization Costs

Appendix E - NIIP Amarillo Alternative

E.1 - NIIP Amarillo Alternative, Operational Model

E.2 - NIIP Amarillo Alternative, O&M Costs

E.3 - NIIP Amarillo Alternative, Winterization Costs

Appendix F - Technical Memorandum No. GG-8311-2 (BOR-TSC 1995)

Appendix G - Water Supply and Storage Options (BOR-FCO 1996)

Appendix H - Gallegos Reservoir Needs and Cost Estimate (Keller Bleisner Engineering 1995)

H.1 - NIIP Evapotranspiration Rates 2000

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix A**

**Figures and Drawings**

## Drawing List

1695-529-12 - NIIP Conveyance System, General Map, Proposed NIIP Alternatives

1695-529-8 - NIIP Cutter Alternative, Pipeline and Features

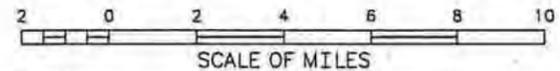
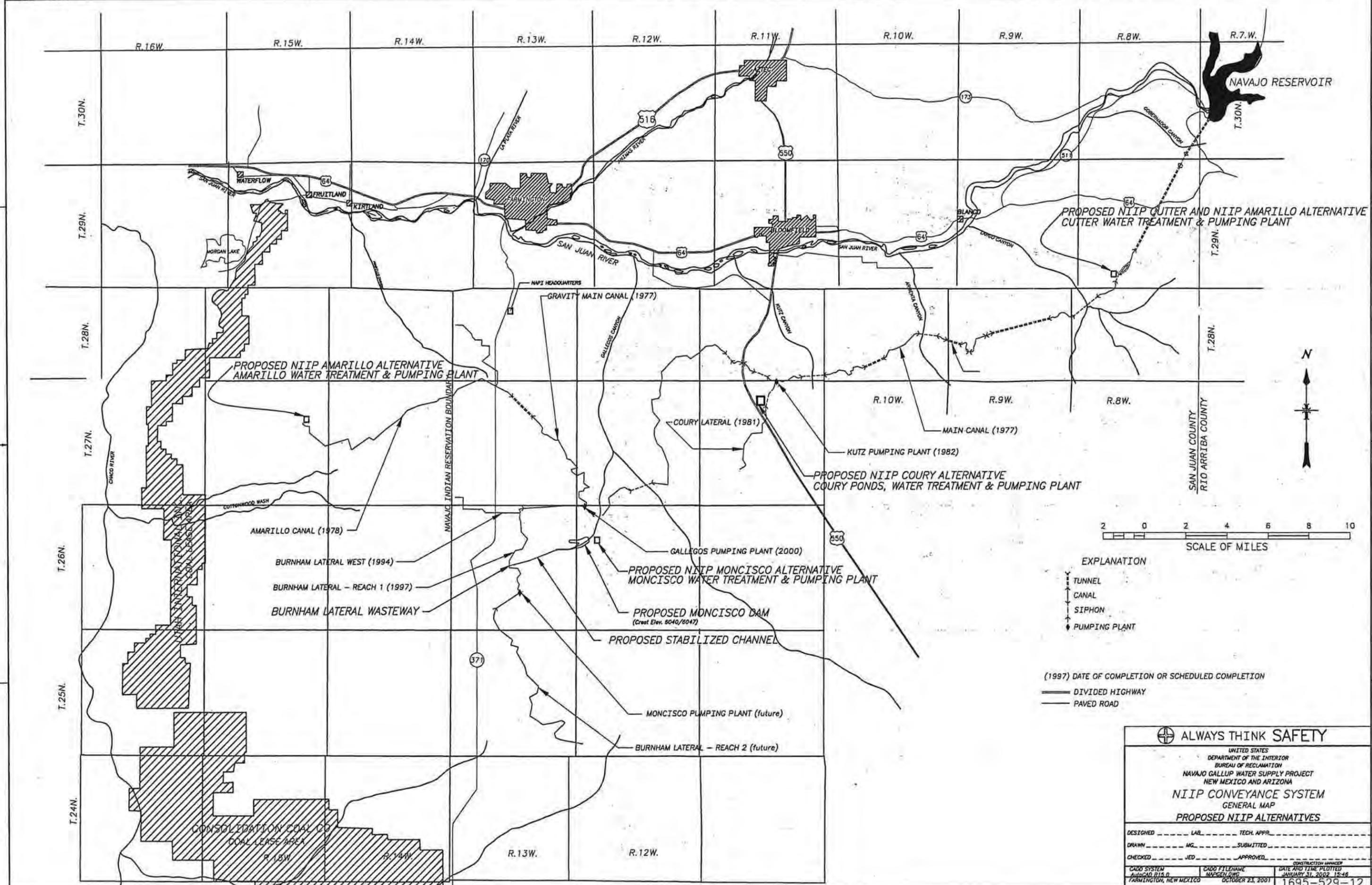
1695-529-9 - NIIP Coury Alternative, Pipeline and Features

1695-529-7 - NIIP Moncisco Alternative, Pipeline and Features

1695-529-11 - NIIP Amarillo Alternative, Pipeline and Features

1695-529-13 - Moncisco Reservoir, Plan and Profile

809-D-4583 - Gallegos Dam, Reconnaissance Design, Moncisco Wash Site



- EXPLANATION**
- TUNNEL
  - CANAL
  - - - SIPHON
  - ◆ PUMPING PLANT

(1997) DATE OF COMPLETION OR SCHEDULED COMPLETION

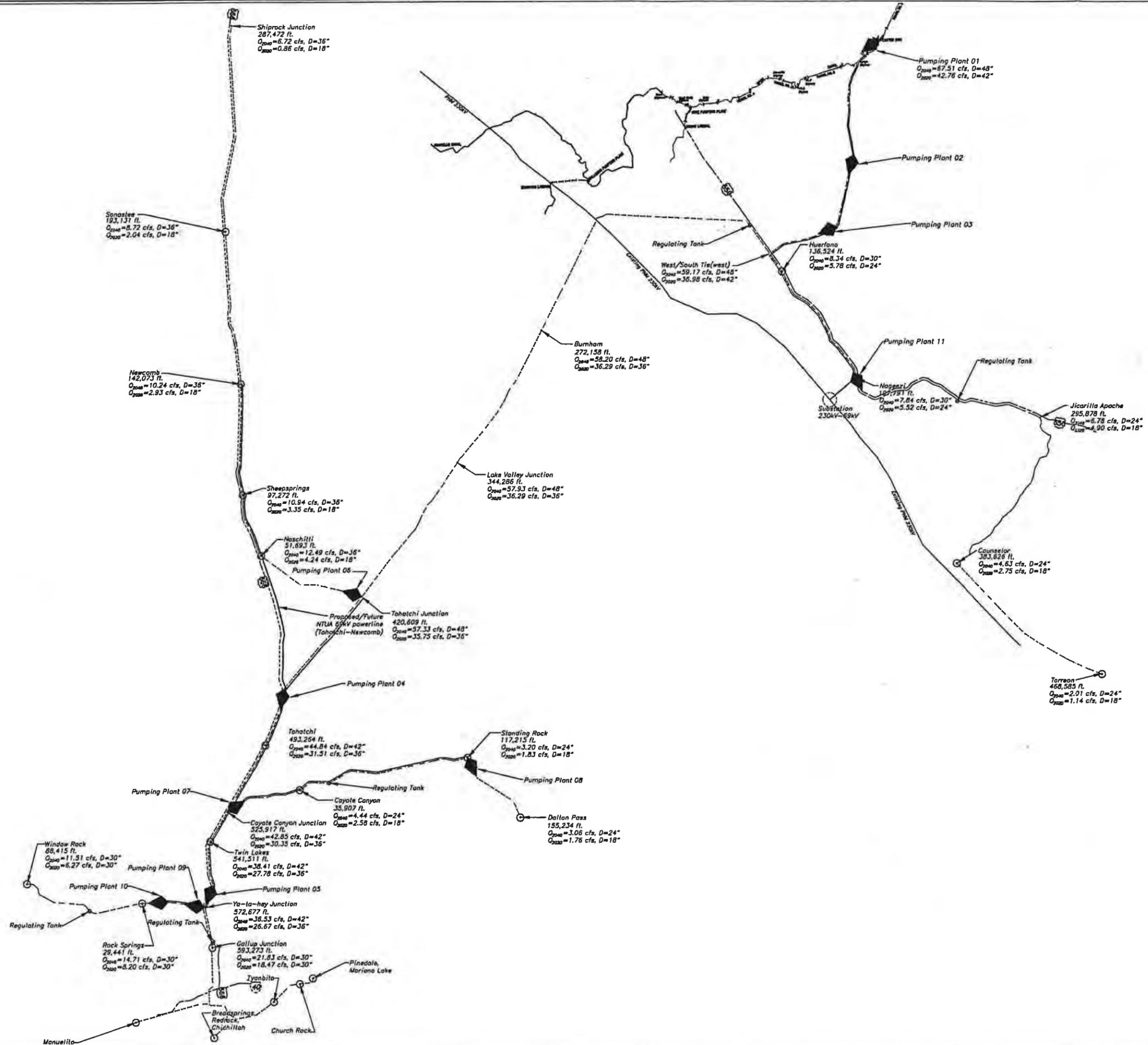
- == DIVIDED HIGHWAY
- PAVED ROAD

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NAVAJO GALLUP WATER SUPPLY PROJECT  
NEW MEXICO AND ARIZONA

**NIP CONVEYANCE SYSTEM  
GENERAL MAP  
PROPOSED NIP ALTERNATIVES**

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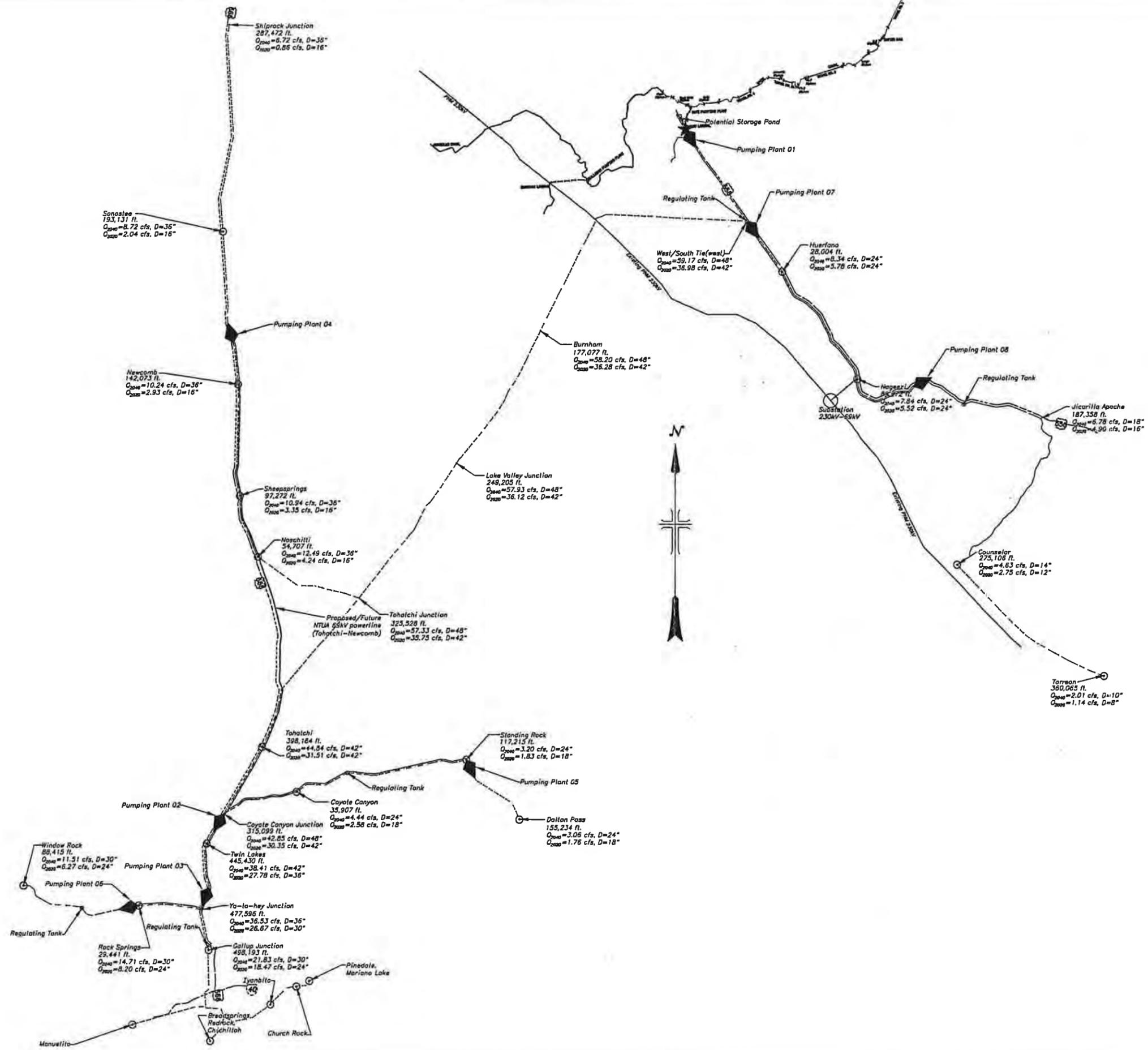
1. 1 Substation
2. 92.26 miles of transmission Line
3. 11 Pumping Plants (relift)
4. 307 miles of pipeline from 48"-18"
5. Green circles are storage tanks
6. NGWSP transmission lines are red
7. Pipeline alignment is black

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NEW MEXICO AND ARIZONA  
**NIP CUTTER ALTERNATIVE  
GENERAL MAP  
PIPELINE AND FEATURES**

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DRAWN \_\_\_\_\_ LAR \_\_\_\_\_ SUBMITTED \_\_\_\_\_  
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1. 1 Substation near Nageezi
2. 73.24 miles of transmission Line
3. 8 Pumping Plants (relift)
4. 295 miles of pipeline from 48" - 8"
5. Green circles are storage tanks
6. NGWSP transmission lines are red
7. Pipeline alignment is black

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NAVAJO GALLUP WATER SUPPLY PROJECT  
NEW MEXICO AND ARIZONA

**NIP COURY ALTERNATIVE**

GENERAL MAP  
PIPELINE AND FEATURES

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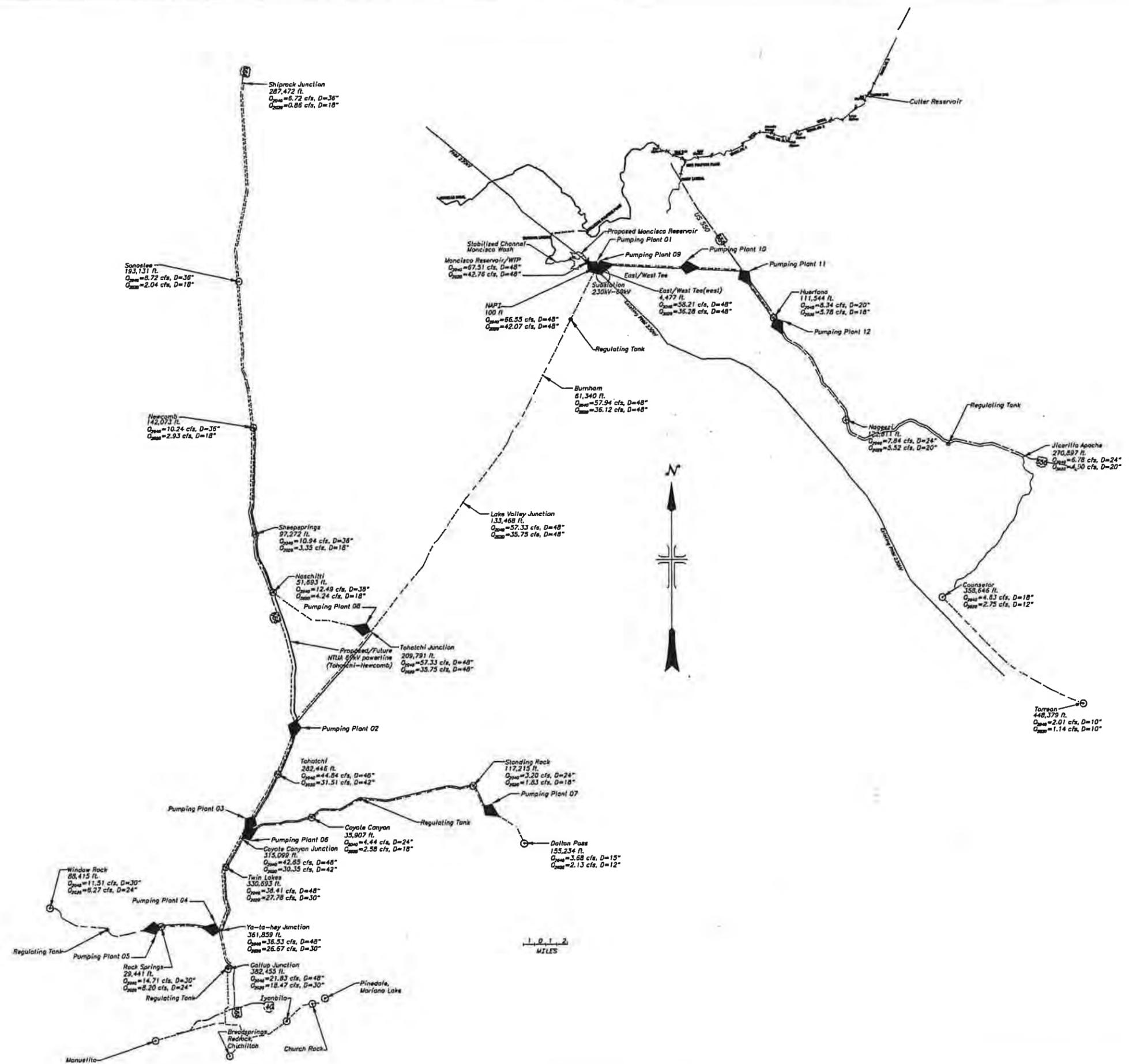
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FARMINGTON, NEW MEXICO  
NOVEMBER 13, 2001  
1695-529-9



1. Substation Near Moncisco
2. 74 miles of transmission Line
3. 12 Pumping Plants (relift)
4. 283 miles of pipeline from 48"-8"
5. Green circles are storage tanks
6. NGWSP transmission lines are red
7. Pipeline alignment is black-----

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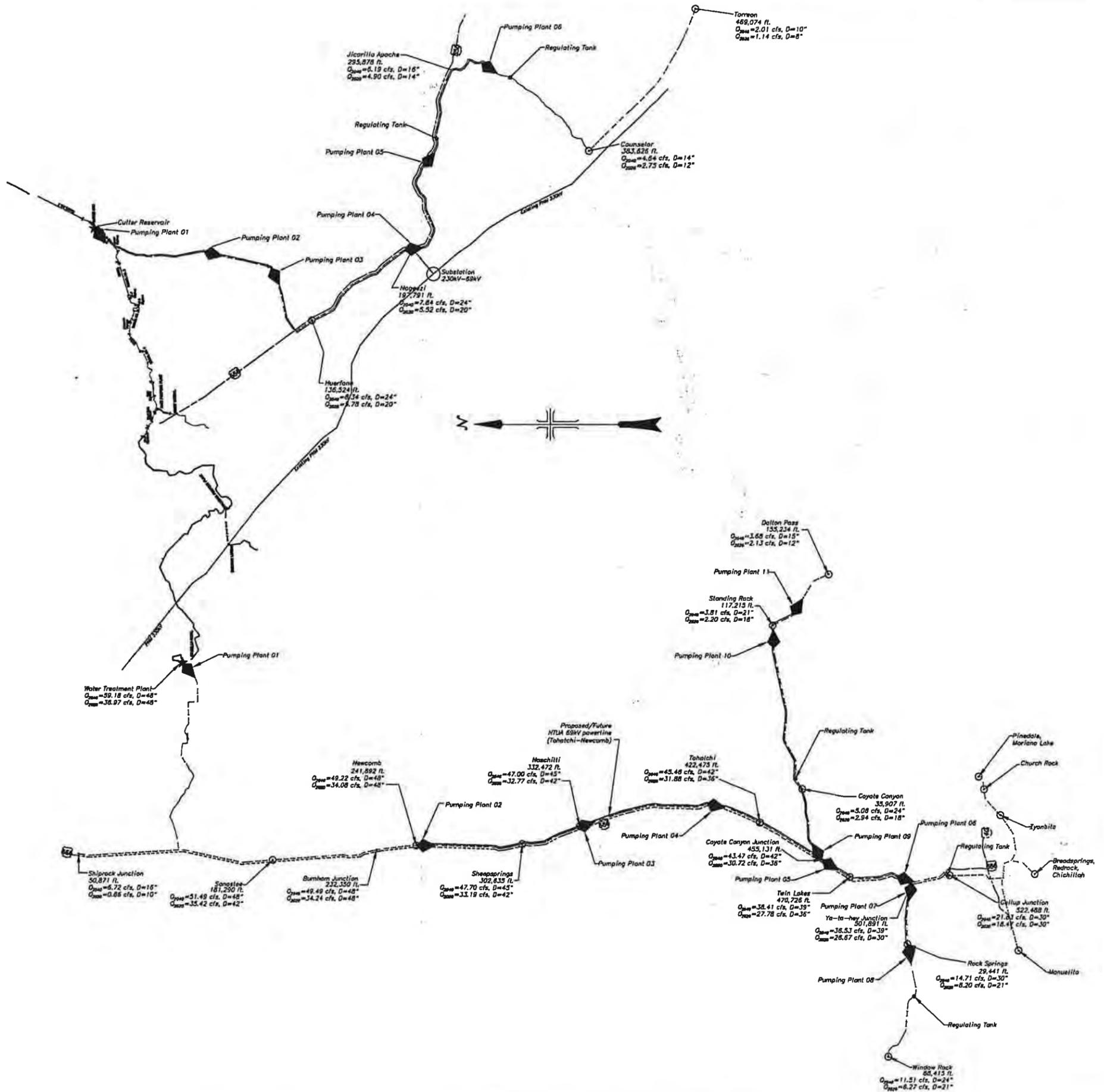
**NIIP MONCISCO ALTERNATIVE  
GENERAL MAP  
PIPELINE AND FEATURES**

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FARMINGTON, NEW MEXICO	NOVEMBER 13, 2001		

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FILEPATH



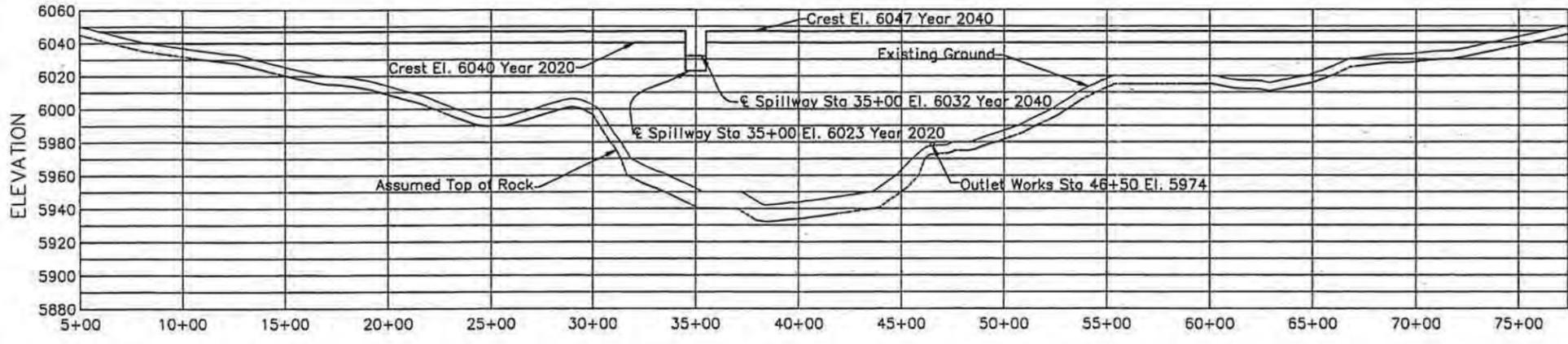
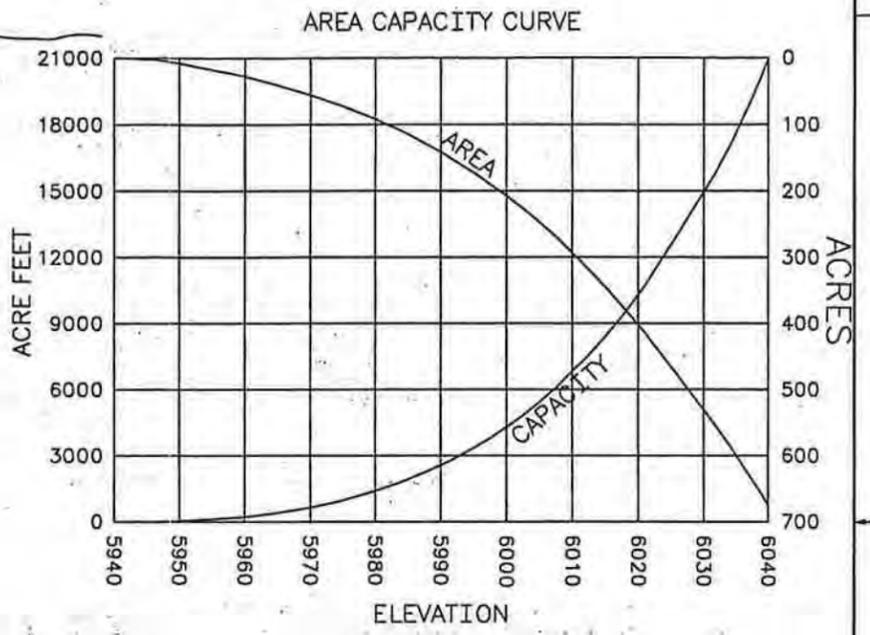
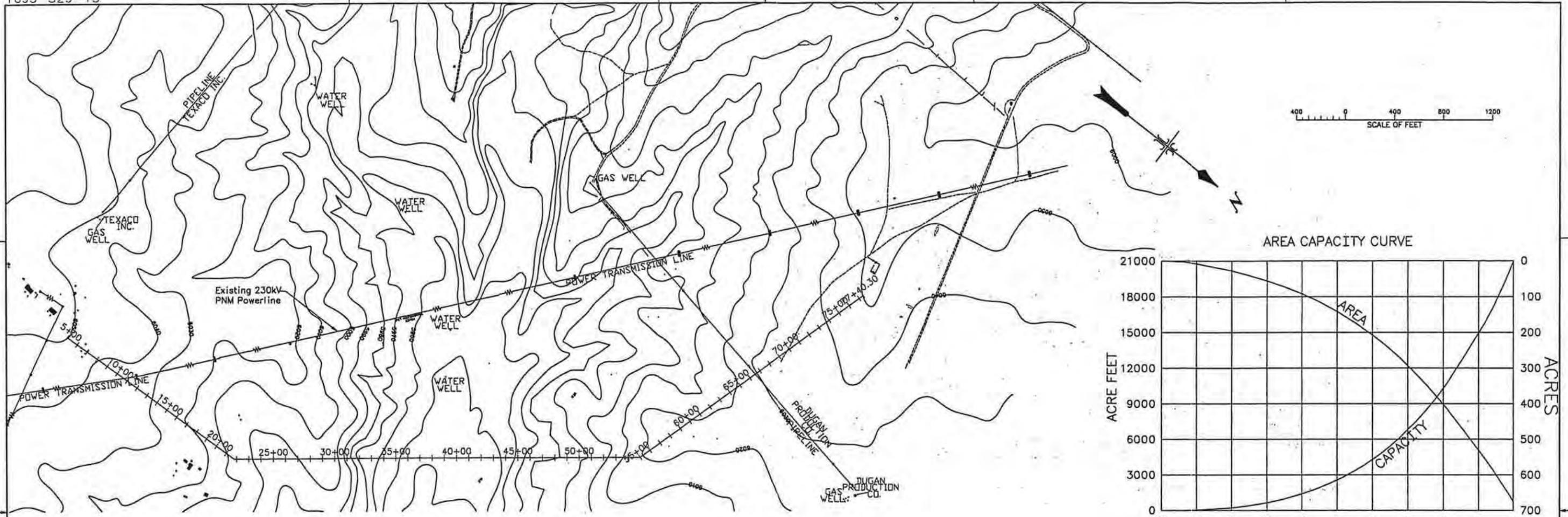
1. 1 Substation Near Cutter PP #4
2. 107 miles of transmission Line
3. 17 Pumping Plants (relift)
4. 262 miles of pipeline from 48"-8"
5. Green circles are storage tanks
6. NGWSP transmission lines are red
7. Pipeline alignment is black

**ALWAYS THINK SAFETY**

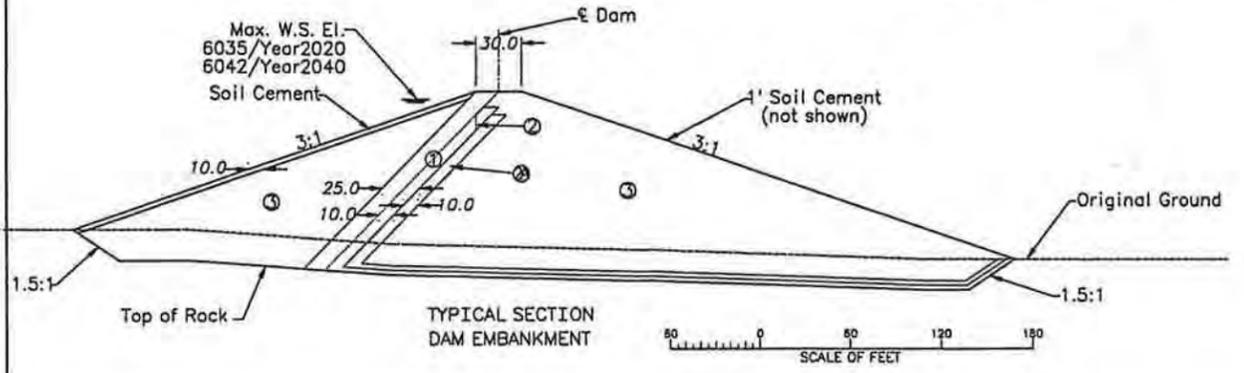
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
NAVAJO GALLUP WATER SUPPLY PROJECT  
NEW MEXICO AND ARIZONA

**NIP AMARILLO ALTERNATIVE  
GENERAL MAP  
PIPELINE AND FEATURES**

DESIGNED _____	LAR _____	TECH. APPR. _____
DRAWN _____	LAR _____	SUBMITTED _____
CHECKED _____	APPROVED _____	CONSTRUCTION MANAGER _____
CADD SYSTEM AutoCAD R15.0	CADD FILENAME 1695-529-11.DWG	DATE AND TIME PLOTTED FEBRUARY 21, 2002 11:28
FARMINGTON, NEW MEXICO	NOVEMBER 29, 2001	1695-529-11



- NOTES:
1. Reference drawing 809-D-4583 for Spillway and Outlet works.
  2. Spillway crest is 6023 and 6032 and MWS is 6035 and 6042 for year 2020 and year 2040 respectively.
  3. Outlet works conservation pool is 6023 and 6032 in year 2020 and 2040.



- EMBANKMENT EXPLANATION
- ① Selected clay material
  - ② Processed sand filter material
  - ③ Processed gravel drain material
  - ④ Clay, silt, sand, gravel, from borrow areas and required excavation

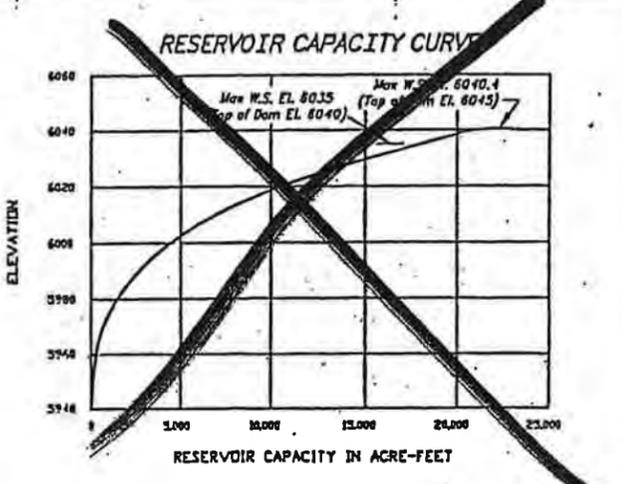
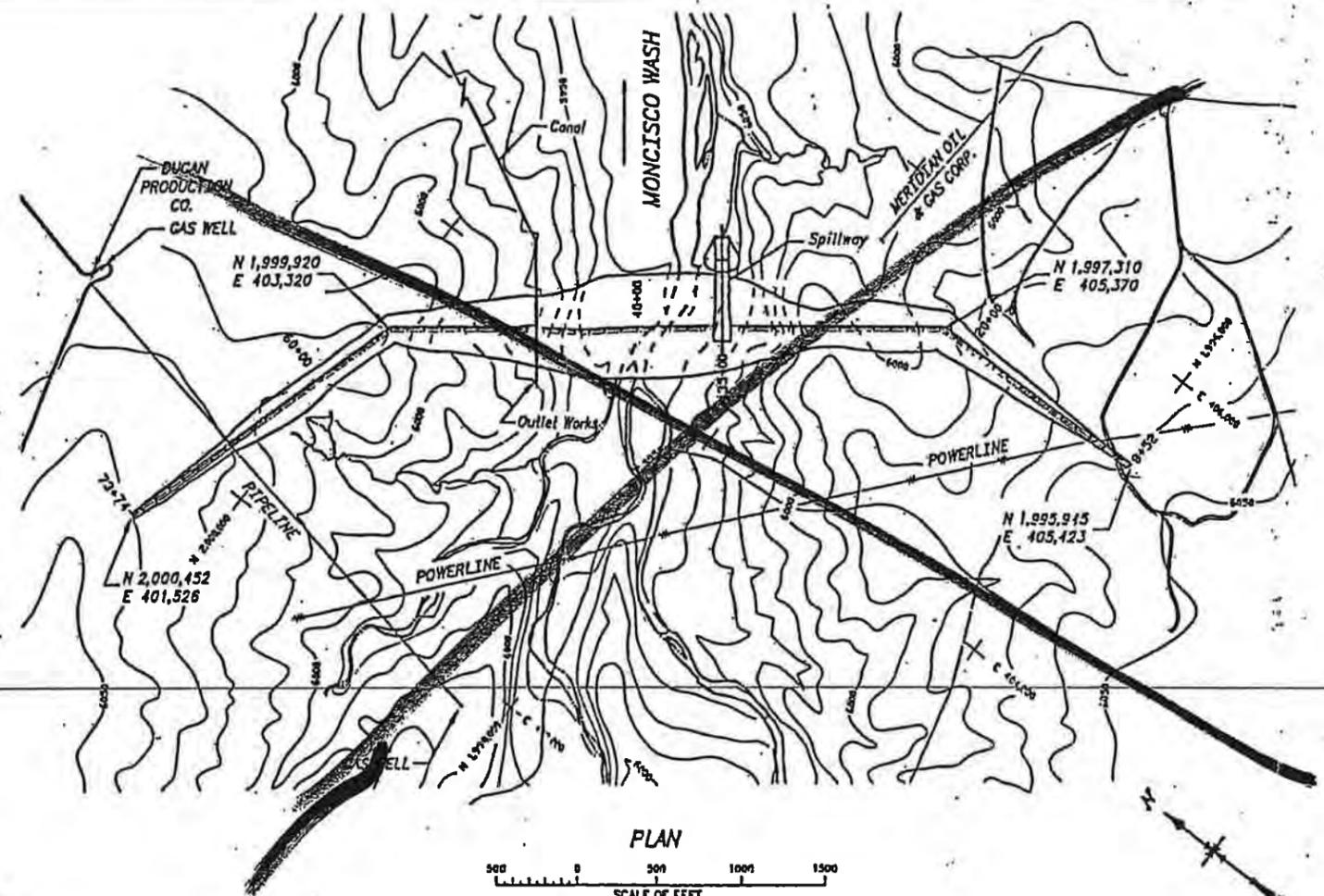
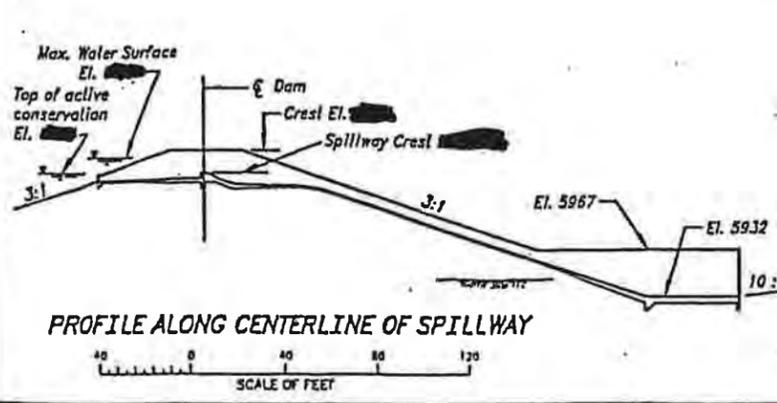
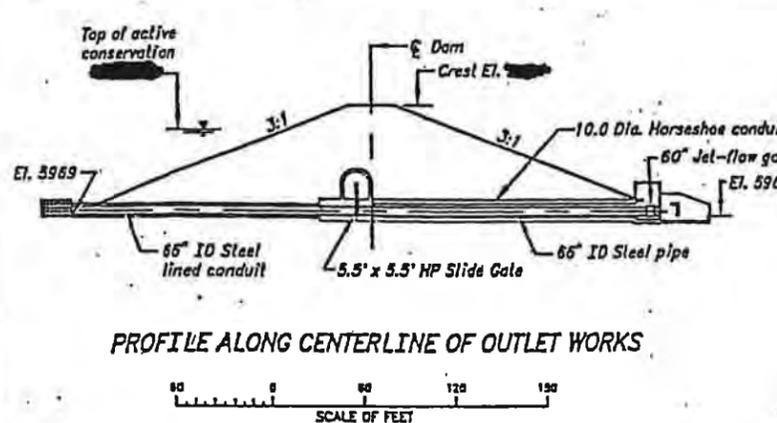
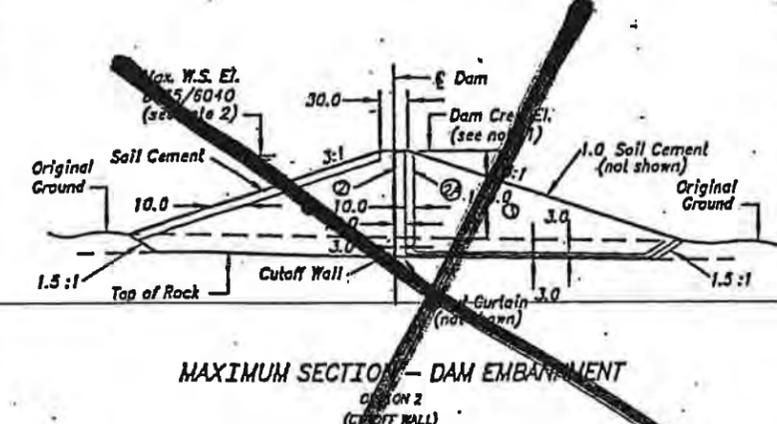
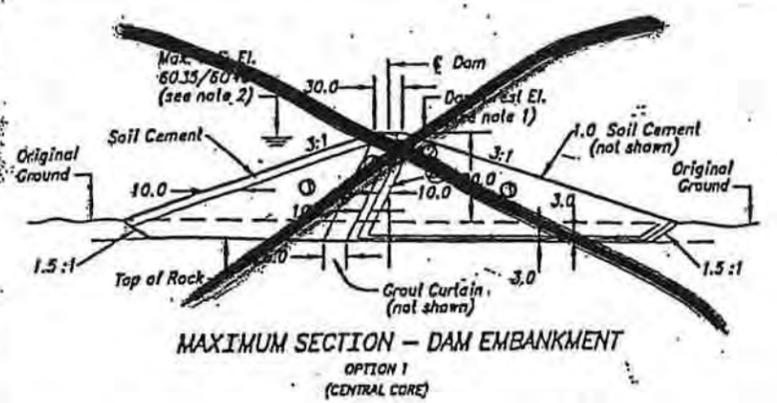
**ALWAYS THINK SAFETY**

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
NAVAJO GALLUP WATER SUPPLY PROJECT  
NEW MEXICO AND ARIZONA

**MONCISCO RESERVOIR  
PLAN AND PROFILE  
STATION 5+00 TO 77+00**

DESIGNED \_\_\_\_\_ LAB \_\_\_\_\_ TECH. APPR. \_\_\_\_\_  
 DRAWN \_\_\_\_\_ LAB \_\_\_\_\_ SUBMITTED \_\_\_\_\_  
 CHECKED \_\_\_\_\_ JED \_\_\_\_\_ APPROVED \_\_\_\_\_

CADD SYSTEM: AUCSAD R14.0  
 CADD FILENAME: MONCISCO.DWG  
 DATE AND TIME PLOTTED: FEBRUARY 1, 2002 08:31  
 FARMINGTON, NEW MEXICO  
 CONSTRUCTION NUMBER: JANUARY 23, 2002  
 1695-529-13

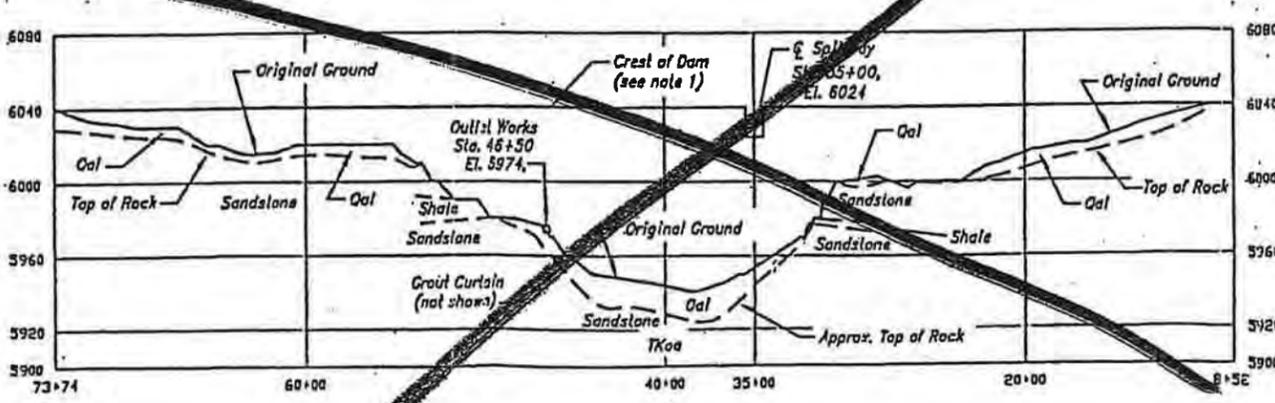


- NOTES**
1. Crest of dam varies based on spillway alternative. Crest of dam elevation 6040 and 100 foot spillway alternative are shown.
  2. Crest elevation 6040 and 100 foot spillway alternative are for the 100 foot wide spillway option. Crest elevation 6045 and MWS elevation 6040 are for the no spillway alternative.

- EMBANKMENT EXPLANATION**
- ① Selected clay material
  - ② Processed sand filter material
  - ③ Processed gravel drain material
  - ④ Clay, silt, sand, gravel, from borrow areas and required excavation

**REFERENCE DRAWINGS**

VICINITY MAP 809-D-4581



FOR INFORMATION ONLY

ALWAYS WEAR SAFETY UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION UPPER COLORADO REGION ANASAZI INDIAN IRRIGATION PROJECT <b>GALLEGOS DAM RECONNAISSANCE DESIGN</b> MONCISCO WASH SITE PLAN, PROFILE, & SECTIONS		
DESIGNED BY: <i>[Signature]</i>	CHECKED BY: <i>[Signature]</i>	DATE: <i>[Date]</i>
DRAWN BY: <i>[Signature]</i>	TECH. APPR. BY: <i>[Signature]</i>	DATE: <i>[Date]</i>
SCALE: <i>[Scale]</i>	DATE AND TIME PLOTTED: <i>[Date/Time]</i>	FIG. NO.: <i>[Fig. No.]</i>
CADD SYSTEM: AutoCAD	CADD FILENAME: <i>[Filename]</i>	DATE AND TIME PLOTTED: <i>[Date/Time]</i>
TEAM: R, COLORADO	FILE: Feb 11, 1993	809-D-4583

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B**

**Moncisco Reservoir**

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.1**

**Moncisco Dam Quantities**

NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 Moncisco Dam Quantities Year 2020

grnd elev	distance(ft)	height(ft)	volume1(cy)	ZONE1 (cy)	ZONE2 (cy)	ZONE2A (cy)	U/SSOILCMT (cy)	ZONE 3 (cy)	D/SSOILCMT (cy)	EXCAVATION (cy)
5940 - 5950	830	95	1,270,361	88,380	65,631	63,264	28,691	1,015,159	9,235	350,444
5950 - 5960	285	85	363,375	27,708	20,531	19,718	8,796	283,785	2,837	107,667
5960 - 5970	250	75	260,417	21,991	16,250	15,537	6,790	197,653	2,196	83,333
5970 - 5980	210	65	174,417	16,528	12,172	11,573	4,926	127,619	1,599	60,667
5980 - 5990	315	55	165,375	18,958	13,825	12,927	6,222	111,414	2,029	40,250
5990 - 6000	210	45	79,917	10,694	7,739	3,500	3,370	53,506	1,107	22,167
6000 - 6010	1035	35	267,375	43,125	30,858	13,417	12,778	162,955	4,243	86,250
6010 - 6020	450	25	71,250	14,583	10,250	4,167	3,889	37,044	1,318	27,500
6020 - 6030	1550	15	124,861	35,880	24,398	8,611	7,654	45,595	2,723	60,278
6030 - 6040	1240	5	31,000	17,222	10,793	2,296	1,531	(1,568)	726	20,667
										2,808,347

dam crest elevation =   
 h = height = height from dam crest to average of grnd elevation  
 area of dam = (30+3h)h  
 volume1 of dam = total volume( area of dam \* distance)  
 distance d = dam length between elevations

ASSUMPTIONS:

crest width 30 feet  
 slopes 3:1  
 suitable foundation from ground excavation   
 feet at elevations below 5980  
 suitable foundation from ground excavation   
 feet at elevations above 5980  
 assume 20 feet of excavation at elevation 5980 = Eb and below and 10 feet excavtion above elevation 5980 = Ea

EQUATIONS:

Zone 1 equation(<5980)  $V = (h+Eb)*d/27$   
 zone1 equation(>5980)  $V = (h+Ea)*d/27$   
 zone 2 equation (<5980)  $V = d*(10(h-5+Eb)+3*3(Eb+h))/27$   
 zone 2 equation (>5980)  $V = d*(10(h-5+Ea)+3*3(Ea+h))/27$   
 zone 2a equation (<5980)  $V = d*(10(h-10+Eb)+3*3(Eb+h-3))/27$   
 zone 2a equation (>5980)  $V = d*(10(h-10+Ea)+3*3(Ea+h-3))/27$   
 upstream soil cement  $V = d*(10+h-16.67)*1*d/27$   
 downstream soil cement  $V = (h*10^{\wedge}5)*1*d/27$   
 zone 3  $V = \text{volume1} - (\text{zone1} + \text{zone2} + \text{zone2a} + d/s \text{ soilcement} + u/s \text{ soilcement})$

NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 Moncisco Dam Quantities Year 2040

grnd elev	distance(ft)	height(ft)	volume1(cy)	ZONE1 (cy)	ZONE2 (cy)	ZONE2A (cy)	U/SSOILCMT (cy)	ZONE 3 (cy)	D/SSOILCMT (cy)	EXCAVATION (cy)
5940 - 5950	830	102	1,429,813	93,759	69,720	67,353	30,843	1,158,223	9,915	376,267
5950 - 5960	285	92	413,693	29,556	21,934	21,122	9,535	328,476	3,071	116,533
5960 - 5970	250	82	300,667	23,611	17,481	16,769	7,438	232,966	2,401	91,111
5970 - 5980	210	72	204,960	17,889	13,207	12,608	5,470	154,015	1,771	67,200
5980 - 5990	315	62	201,390	21,000	15,377	14,478	7,039	141,209	2,287	45,150
5990 - 6000	210	52	100,660	12,056	8,773	4,044	3,915	70,593	1,279	25,433
6000 - 6010	1035	42	353,510	49,833	35,957	16,100	15,461	231,068	5,091	102,350
6010 - 6020	450	32	101,700	17,500	12,467	5,333	5,056	59,658	1,687	34,500
6020 - 6030	1550	22	205,633	45,926	32,033	12,630	11,673	99,378	3,994	84,389
6030 - 6040	1240	12	76,329	25,259	16,901	5,511	4,746	22,169	1,743	39,956

dam crest elevation = [REDACTED]

h = height = height from dam crest to average of grnd elevation

area of dam =  $(30+3h)h$

volume1 of dam = total volume( area of dam \* distance)

distance d = dam length between elevations

ASSUMPTIONS:

crest width 30 feet

slopes 3:1

suitable foundation from ground excavation [REDACTED] feet at elevations below 5980

suitable foundation from ground excavation [REDACTED] feet at elevations above 5980

assume 20 feet of excavation at elevation 5980 = Eb and below and 10 feet excavtion above elevation 5980 = Ea

EQUATIONS:

Zone 1 equation(<5980)  $V = (h+Eb)*d/27$

zone1 equation(>5980)  $V = (h+Ea)*d/27$

zone 2 equation (<5980)  $V = d*(10(h-5+Eb)+3*3(Eb+h))/27$

zone 2 equation (>5980)  $V = d*(10(h-5+Ea)+3*3(Ea+h))/27$

zone 2a equation (<5980)  $V = d*(10(h-10+Eb)+3*3(Eb+h-3))/27$

zone 2a equation (>5980)  $V = d*(10(h-10+Ea)+3*3(Ea+h-3))/27$

upstream soil cement  $V = d*(10+h-16.67)*1*d/27$

downstream soil cement  $V = (h*10^1.5)*1*d/27$

zone 3  $V = \text{volume1} - (\text{zone1} + \text{zone2} + \text{zone2a} + d/s \text{ soilcement} + u/s \text{ soilcement})$

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.2**

**NTUA DEMAND PATTERN**



THE  
NAVAJO  
NATION

NGWSP

P.O. BOX 9000 • WINDOW ROCK, ARIZONA 86515 • (520) 871-6000

KELSEY A. BEGAYE  
PRESIDENT

DR. TAYLOR MCKENZIE  
Vice President

TELECOPY TRANSMITTAL

FROM

WATER MANAGEMENT BRANCH  
P.O. Box 678  
Fort Defiance, Arizona 86504

DATE: 3/22/01

TO: Leon Bano's NO. PAGES: 3  
BOL-Farmington Const. office. includes coversheet  
Farmington, NM

FAX NUMBER: (505) 325-3599

FROM: Robert Kirk  
NNIDNR-WMB

TELEPHONE: (520) 729-4004  
FAX NO : (520) 729-4126

SUBJECT: Here's the Water Demand Percentage  
usage for Monesco Modelling.  
Its from the Nav Tribal Utility Authority  
Shiprock Water Supply Study.  
Hope this helps.  
Robert Kirk

IF YOU ENCOUNTER PROBLEMS WITH RECEIVING THIS FAX, PLEASE CALL  
(520) 729-4004. THANK YOU.

Table 5-2  
 Seasonal Water Use Patterns for Shiprock Side Customers from March 1992 through February 1993

	MAR	APR	MAY	JUNE	JULY	AUG
Residential Metered Use	11,219	8,911	10,653	12,581	13,224	12,144
Percent of Total Residential Use	8%	7%	8%	9%	10%	9%
Commercial/Institutional Metered Use	14,046	9,833	14,266	15,642	15,793	14,791
Percent of Total Comm./Inst. Use	10%	7%	10%	11%	11%	10%
All Metered Uses	25,265	18,744	24,919	28,223	29,017	26,935
Percent of Total Use	9%	7%	9%	10%	10%	10%
Percent of Total Monthly Metered Use by Commercial/Institutional	56%	52%	57%	55%	54%	55%

	SEPT	OCT	NOV	DEC	JAN	FEB	12-MONTH TOTAL
Residential Metered Use	14,136	12,523	10,036	10,004	11,630	9,247	136,308
Percent of Total Residential Use	10%	9%	7%	7%	9%	7%	100%
Commercial/Institutional Metered Use	15,126	11,380	9,220	8,746	9,426	8,548	146,817
Percent of Total Comm./Inst. Use	10%	8%	6%	6%	6%	6%	100%
All Metered Uses	29,262	23,903	19,256	18,750	21,056	17,795	283,125
Percent of Total Use	10%	8%	7%	7%	7%	6%	100%
Percent of Total Monthly Metered Use by Commercial/Institutional	52%	48%	48%	47%	45%	48%	52%

**NOTES**

1. Residential metered use includes are individual homeowners billed per Rate Codes #25 and 61 which have 1" meters
2. Commercial and Institutional customers are businesses, schools, hospitals, and federal/tribal government agencies billed per Rate Codes #64 and higher which have 1" or larger meters
3. All metered use expressed in Gallonsx1000 for the period from 3/1/92 through 2/28/93

**NAVAJO TRIBAL UTILITY AUTHORITY  
SHIPROCK WATER SUPPLY STUDY**

**FINAL**

December 1993

MOLZEN-CORBIN & Associates



CAT  
14  
BOOKID  
3184

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.3**

**NIIP Moncisco Operations Model  
Year 2020 and 2040**

\*\*\*\*\*

NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
October	15	0.05	525.59	2548.8	61.75	2023.21	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	16	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	428.56	11197.81	64.18	1.8815	0.5507
October	17	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	426.82	11133.63	64.17	1.8739	0.5485
October	18	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	425.07	11069.45	64.16	1.8662	0.5462
October	19	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	423.32	11005.29	64.15	1.8585	0.5440
October	20	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	421.57	10941.14	64.14	1.8508	0.5417
October	21	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	419.82	10877.00	64.13	1.8431	0.5395
October	22	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	418.06	10812.87	64.12	1.8354	0.5372
October	23	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	416.30	10748.74	64.11	1.8277	0.5350
October	24	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	414.54	10684.63	64.10	1.8200	0.5327
October	25	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	412.78	10620.53	64.09	1.8122	0.5304
October	26	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	411.01	10556.44	64.08	1.8045	0.5282
October	27	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	409.24	10492.35	64.07	1.7967	0.5259
October	28	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	407.46	10428.28	64.06	1.7889	0.5236
October	29	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	405.69	10364.22	64.05	1.7811	0.5213
October	30	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	403.91	10300.17	64.04	1.7733	0.5190
October	31	0	0.00	2548.8	61.75	0.00	0.00	0.00439032	0.001285	402.13	10236.13	64.03	1.7655	0.5168
November	1	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	400.54	10179.14	56.98	0.8892	0.2603
November	2	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	398.95	10122.16	56.98	0.8857	0.2592
November	3	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	397.35	10065.18	56.97	0.8821	0.2582
November	4	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	395.76	10008.21	56.97	0.8786	0.2572
November	5	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	394.16	9951.24	56.96	0.8750	0.2561

\*\*\*\*\*

NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

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November	6	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	392.56	9894.28	56.96	0.8715	0.2551
November	7	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	390.95	9837.32	56.95	0.8679	0.2540
November	8	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	389.35	9780.37	56.95	0.8644	0.2530
November	9	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	387.74	9723.42	56.94	0.8608	0.2520
November	10	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	386.13	9666.47	56.94	0.8572	0.2509
November	11	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	384.51	9609.53	56.94	0.8536	0.2499
November	12	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	382.90	9552.60	56.93	0.8500	0.2488
November	13	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	381.28	9495.66	56.93	0.8464	0.2478
November	14	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	379.66	9438.74	56.92	0.8428	0.2467
November	15	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	378.03	9381.82	56.92	0.8392	0.2456
November	16	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	376.40	9324.90	56.91	0.8356	0.2446
November	17	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	374.77	9267.99	56.91	0.8320	0.2435
November	18	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	373.14	9211.08	56.90	0.8284	0.2425
November	19	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	371.50	9154.18	56.90	0.8247	0.2414
November	20	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	369.87	9097.28	56.89	0.8211	0.2403
November	21	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	368.22	9040.39	56.89	0.8175	0.2393
November	22	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	366.58	8983.50	56.88	0.8138	0.2382
November	23	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	364.93	8926.61	56.88	0.8102	0.2371
November	24	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	363.28	8869.73	56.87	0.8065	0.2361
November	25	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	361.63	8812.86	56.87	0.8028	0.2350
November	26	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	359.97	8755.99	56.87	0.7991	0.2339
November	27	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	358.31	8699.12	56.86	0.7955	0.2328

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
November	28	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	356.65	8642.26	56.86	0.7918	0.2318
November	29	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	354.99	8585.41	56.85	0.7881	0.2307
November	30	0	0.00	2548.8	55.83	0.00	0.00	0.00222	0.0006498	353.32	8528.56	56.85	0.7844	0.2296
December	1	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	351.71	8473.82	54.73	0.5446	0.1594
December	2	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	350.10	8419.08	54.73	0.5421	0.1587
December	3	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	348.48	8364.35	54.73	0.5396	0.1579
December	4	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	346.86	8309.62	54.73	0.5371	0.1572
December	5	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	345.24	8254.90	54.72	0.5346	0.1565
December	6	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	343.62	8200.18	54.72	0.5321	0.1557
December	7	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	341.99	8145.46	54.72	0.5295	0.1550
December	8	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	340.36	8090.74	54.71	0.5270	0.1543
December	9	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	338.73	8036.03	54.71	0.5245	0.1535
December	10	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	337.09	7981.32	54.71	0.5219	0.1528
December	11	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	335.45	7926.62	54.70	0.5194	0.1520
December	12	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	333.81	7871.91	54.70	0.5169	0.1513
December	13	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	332.16	7817.21	54.70	0.5143	0.1505
December	14	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	330.51	7762.52	54.69	0.5118	0.1498
December	15	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	328.86	7707.83	54.69	0.5092	0.1490
December	16	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	327.20	7653.14	54.69	0.5066	0.1483
December	17	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	325.54	7598.45	54.68	0.5041	0.1475
December	18	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	323.88	7543.77	54.68	0.5015	0.1468
December	19	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	322.22	7489.09	54.68	0.4989	0.1460

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
December	20	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	320.55	7434.41	54.67	0.4963	0.1453
December	21	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	318.87	7379.74	54.67	0.4937	0.1445
December	22	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	317.20	7325.07	54.67	0.4911	0.1438
December	23	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	315.52	7270.41	54.66	0.4885	0.1430
December	24	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	313.83	7215.74	54.66	0.4859	0.1422
December	25	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	312.14	7161.08	54.66	0.4833	0.1415
December	26	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	310.45	7106.43	54.65	0.4807	0.1407
December	27	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	308.76	7051.78	54.65	0.4781	0.1399
December	28	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	307.06	6997.13	54.65	0.4754	0.1392
December	29	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	305.36	6942.48	54.64	0.4728	0.1384
December	30	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	303.65	6887.84	54.64	0.4702	0.1376
December	31	0	0.00	2548.8	54.03	0.00	0.00	0.00154839	0.0004532	301.94	6833.20	54.64	0.4675	0.1368
January	1	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	300.23	6778.57	54.63	0.4620	0.1352
January	2	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	298.51	6723.94	54.62	0.4593	0.1344
January	3	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	296.79	6669.32	54.62	0.4567	0.1337
January	4	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	295.06	6614.69	54.62	0.4540	0.1329
January	5	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	293.34	6560.08	54.61	0.4514	0.1321
January	6	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	291.60	6505.46	54.61	0.4487	0.1313
January	7	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	289.86	6450.85	54.61	0.4460	0.1305
January	8	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	288.12	6396.24	54.60	0.4433	0.1298
January	9	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	286.38	6341.64	54.60	0.4406	0.1290
January	10	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	284.63	6287.04	54.60	0.4380	0.1282

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
January	11	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	282.87	6232.44	54.59	0.4353	0.1274
January	12	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	281.11	6177.85	54.59	0.4325	0.1266
January	13	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	279.35	6123.26	54.59	0.4298	0.1258
January	14	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	277.58	6068.67	54.58	0.4271	0.1250
January	15	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	275.81	6014.09	54.58	0.4244	0.1242
January	16	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	274.03	5959.51	54.58	0.4217	0.1234
January	17	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	272.25	5904.93	54.57	0.4189	0.1226
January	18	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	270.46	5850.36	54.57	0.4162	0.1218
January	19	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	268.67	5795.79	54.57	0.4134	0.1210
January	20	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	266.88	5741.23	54.56	0.4106	0.1202
January	21	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	265.08	5686.66	54.56	0.4079	0.1194
January	22	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	263.27	5632.11	54.55	0.4051	0.1186
January	23	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	261.46	5577.55	54.55	0.4023	0.1178
January	24	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	259.64	5523.00	54.55	0.3995	0.1169
January	25	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	257.82	5468.45	54.54	0.3967	0.1161
January	26	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	256.00	5413.91	54.54	0.3939	0.1153
January	27	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	254.17	5359.37	54.54	0.3911	0.1145
January	28	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	252.33	5304.83	54.53	0.3883	0.1136
January	29	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	250.49	5250.30	54.53	0.3854	0.1128
January	30	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	248.64	5195.77	54.53	0.3826	0.1120
January	31	0	0.00	2548.8	54.03	0.00	0.00	0.00153871	0.0004504	246.79	5141.25	54.52	0.3797	0.1111
February	1	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	245.02	5089.30	51.95	0.5189	0.1519

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
February	2	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	243.24	5037.35	51.94	0.5152	0.1508
February	3	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	241.46	4985.41	51.94	0.5114	0.1497
February	4	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	239.67	4933.47	51.93	0.5076	0.1486
February	5	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	237.88	4881.54	51.93	0.5038	0.1475
February	6	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	236.09	4829.62	51.92	0.5000	0.1463
February	7	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	234.28	4777.70	51.92	0.4962	0.1452
February	8	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	232.48	4725.78	51.91	0.4924	0.1441
February	9	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	230.66	4673.87	51.91	0.4885	0.1430
February	10	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	228.84	4621.97	51.90	0.4847	0.1419
February	11	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	227.02	4570.06	51.90	0.4808	0.1407
February	12	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	225.19	4518.17	51.89	0.4769	0.1396
February	13	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	223.35	4466.28	51.89	0.4730	0.1385
February	14	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	221.51	4414.39	51.88	0.4691	0.1373
February	15	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	219.66	4362.51	51.88	0.4652	0.1362
February	16	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	217.80	4310.64	51.87	0.4613	0.1350
February	17	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	215.94	4258.77	51.87	0.4573	0.1339
February	18	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	214.07	4206.90	51.86	0.4534	0.1327
February	19	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	212.20	4155.04	51.86	0.4494	0.1315
February	20	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	210.32	4103.18	51.85	0.4454	0.1304
February	21	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	208.43	4051.33	51.84	0.4414	0.1292
February	22	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	206.54	3999.49	51.84	0.4374	0.1280
February	23	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	204.63	3947.65	51.83	0.4334	0.1269

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

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 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
February	24	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	202.73	3895.82	51.83	0.4293	0.1257
February	25	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	200.81	3843.99	51.82	0.4253	0.1245
February	26	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	198.89	3792.16	51.82	0.4212	0.1233
February	27	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	196.96	3740.34	51.81	0.4171	0.1221
February	28	0	0.00	2548.8	51.27	0.00	0.00	0.00211786	0.0006199	195.02	3688.53	51.81	0.4130	0.1209
March	1	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	203.45	3915.58	70.51	0.8059	0.2359
March	2	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	211.75	4142.59	70.55	0.8388	0.2455
March	3	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	219.91	4369.56	70.59	0.8711	0.2550
March	4	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	227.95	4596.48	70.64	0.9030	0.2643
March	5	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	235.87	4823.36	70.68	0.9343	0.2735
March	6	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	243.68	5050.21	70.72	0.9653	0.2825
March	7	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	251.39	5277.01	70.76	0.9958	0.2915
March	8	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	259.00	5503.77	70.79	1.0260	0.3003
March	9	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	266.52	5730.50	70.83	1.0558	0.3090
March	10	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	273.96	5957.18	70.87	1.0852	0.3176
March	11	0.01	101.48	2548.8	69.47	2447.32	297.52	0.00396129	0.0011595	281.31	6183.83	70.91	1.1143	0.3262
March	12	0.02	223.36	2548.8	69.47	2325.44	297.52	0.00396129	0.0011595	288.58	6410.44	70.95	1.1431	0.3346
March	13	0.02	236.76	2548.8	69.47	2312.04	297.52	0.00396129	0.0011595	295.77	6637.01	70.98	1.1716	0.3429
March	14	0.02	245.09	2548.8	69.47	2303.71	297.52	0.00396129	0.0011595	302.89	6863.55	71.02	1.1998	0.3512
March	15	0.02	253.24	2548.8	69.47	2295.56	297.52	0.00396129	0.0011595	309.95	7090.05	71.06	1.2278	0.3594
March	16	0.03	256.91	2548.8	69.47	2291.89	297.52	0.00396129	0.0011595	316.93	7316.51	71.09	1.2555	0.3675
March	17	0.02	249.43	2548.8	69.47	2299.37	297.52	0.00396129	0.0011595	323.86	7542.94	71.13	1.2829	0.3755

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
March	18	0.02	249.33	2548.8	69.47	2299.47	297.52	0.00396129	0.0011595	330.72	7769.33	71.16	1.3101	0.3835
March	19	0.02	250.62	2548.8	69.47	2298.18	297.52	0.00396129	0.0011595	337.52	7995.69	71.20	1.3370	0.3913
March	20	0.03	264.15	2548.8	69.47	2284.65	297.52	0.00396129	0.0011595	344.27	8222.01	71.23	1.3637	0.3992
March	21	0.03	280.02	2548.8	69.47	2268.78	297.52	0.00396129	0.0011595	350.96	8448.30	71.27	1.3902	0.4069
March	22	0.03	295.88	2548.8	69.47	2252.92	297.52	0.00396129	0.0011595	357.60	8674.55	71.30	1.4165	0.4146
March	23	0.03	303.40	2548.8	69.47	2245.40	297.52	0.00396129	0.0011595	364.18	8900.77	71.33	1.4426	0.4223
March	24	0.03	293.66	2548.8	69.47	2255.14	297.52	0.00396129	0.0011595	370.72	9126.96	71.37	1.4685	0.4298
March	25	0.03	295.73	2548.8	69.47	2253.07	297.52	0.00396129	0.0011595	377.21	9353.11	71.40	1.4942	0.4374
March	26	0.03	296.15	2548.8	69.47	2252.65	297.52	0.00396129	0.0011595	383.65	9579.23	71.43	1.5198	0.4448
March	27	0.03	297.63	2548.8	69.47	2251.17	297.52	0.00396129	0.0011595	390.05	9805.32	71.47	1.5451	0.4523
March	28	0.03	304.21	2548.8	69.47	2244.59	297.52	0.00396129	0.0011595	396.41	10031.37	71.50	1.5703	0.4596
March	29	0.03	321.19	2548.8	69.47	2227.61	297.52	0.00396129	0.0011595	402.72	10257.39	71.53	1.5953	0.4669
March	30	0.03	334.80	2548.8	69.47	2214.00	297.52	0.00396129	0.0011595	408.99	10483.38	71.56	1.6201	0.4742
March	31	0.03	341.05	2548.8	69.47	2207.75	297.52	0.00396129	0.0011595	415.22	10709.33	71.59	1.6448	0.4814
April	1	0.04	363.06	2548.8	55.83	2185.74	297.52	0.00645	0.0018879	421.75	10947.56	59.35	2.7203	0.7962
April	2	0.04	383.85	2548.8	55.83	2164.95	297.52	0.00645	0.0018879	428.23	11185.73	59.40	2.7621	0.8085
April	3	0.04	422.13	2548.8	55.83	2126.67	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	4	0.04	438.63	2548.8	55.83	2110.17	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	5	0.05	477.91	2548.8	55.83	2070.89	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	6	0.05	522.80	2548.8	55.83	2026.00	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	7	0.05	544.01	2548.8	55.83	2004.79	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	8	0.06	569.69	2548.8	55.83	1979.11	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
April	9	0.06	606.45	2548.8	55.83	1942.35	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	10	0.06	652.83	2548.8	55.83	1895.97	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	11	0.06	652.92	2548.8	55.83	1895.88	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	12	0.07	671.01	2548.8	55.83	1877.79	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	13	0.07	708.25	2548.8	55.83	1840.55	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	14	0.07	720.76	2548.8	55.83	1828.04	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	15	0.07	730.75	2548.8	55.83	1818.05	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	16	0.07	751.11	2548.8	55.83	1797.69	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	17	0.08	783.03	2548.8	55.83	1765.77	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	18	0.08	796.70	2548.8	55.83	1752.10	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	19	0.08	798.78	2548.8	55.83	1750.02	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	20	0.08	806.57	2548.8	55.83	1742.23	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	21	0.08	848.65	2548.8	55.83	1700.15	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	22	0.09	880.73	2548.8	55.83	1668.07	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	23	0.09	904.47	2548.8	55.83	1644.33	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	24	0.09	961.65	2548.8	55.83	1587.15	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	25	0.10	998.41	2548.8	55.83	1550.39	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	26	0.10	1018.63	2548.8	55.83	1530.17	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	27	0.11	1066.02	2548.8	55.83	1482.78	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	28	0.11	1122.37	2548.8	55.83	1426.43	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	29	0.12	1171.11	2548.8	55.83	1377.69	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124
April	30	0.12	1226.60	2548.8	55.83	1322.20	297.52	0.00645	0.0018879	430.30	11262.00	59.42	2.7754	0.8124

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet 3.8422	seepage losses acre-feet 1.1246
May	1	0.12	1265.64	2548.8	69.47	1283.16	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	2	0.13	1300.61	2548.8	69.47	1248.19	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	3	0.13	1300.31	2548.8	69.47	1248.49	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	4	0.13	1318.14	2548.8	69.47	1230.66	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	5	0.14	1376.92	2548.8	69.47	1171.88	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	6	0.14	1441.43	2548.8	69.47	1107.37	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	7	0.14	1462.47	2548.8	69.47	1086.33	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	8	0.14	1469.37	2548.8	69.47	1079.43	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	9	0.15	1510.27	2548.8	69.47	1038.53	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	10	0.15	1501.31	2548.8	69.47	1047.49	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	11	0.15	1523.70	2548.8	69.47	1025.10	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	12	0.15	1558.62	2548.8	69.47	990.18	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	13	0.16	1611.11	2548.8	69.47	937.69	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	14	0.16	1593.87	2548.8	69.47	954.93	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	15	0.15	1556.73	2548.8	69.47	992.07	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	16	0.15	1517.10	2548.8	69.47	1031.70	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	17	0.15	1517.17	2548.8	69.47	1031.63	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	18	0.15	1559.64	2548.8	69.47	989.16	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	19	0.15	1529.94	2548.8	69.47	1018.86	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	20	0.15	1499.70	2548.8	69.47	1049.10	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	21	0.14	1459.90	2548.8	69.47	1088.90	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	22	0.14	1435.35	2548.8	69.47	1113.45	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet 3.8422	seepage losses acre-feet 1.1246
May	23	0.14	1439.19	2548.8	69.47	1109.61	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	24	0.15	1517.44	2548.8	69.47	1031.36	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	25	0.16	1576.95	2548.8	69.47	971.85	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	26	0.16	1634.12	2548.8	69.47	914.68	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	27	0.16	1651.06	2548.8	69.47	897.74	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	28	0.16	1646.39	2548.8	69.47	902.41	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	29	0.17	1694.86	2548.8	69.47	853.94	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	30	0.18	1792.47	2548.8	69.47	756.33	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
May	31	0.19	1902.00	2548.8	69.47	646.80	297.52	0.00892903	0.0026135	430.30	11262.00	74.44	3.8422	1.1246
June	1	0.20	1979.82	2548.8	79.76	568.98	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	2	0.20	2022.21	2548.8	79.76	526.59	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	3	0.20	2028.09	2548.8	79.76	520.71	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	4	0.20	2061.52	2548.8	79.76	487.28	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	5	0.21	2082.50	2548.8	79.76	466.30	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	6	0.21	2137.86	2548.8	79.76	410.94	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	7	0.22	2225.42	2548.8	79.76	323.38	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	8	0.23	2291.13	2548.8	79.76	257.67	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	9	0.23	2336.28	2548.8	79.76	212.52	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	10	0.23	2344.93	2548.8	79.76	203.87	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	11	0.23	2362.28	2548.8	79.76	186.52	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	12	0.23	2365.49	2548.8	79.76	183.31	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	13	0.24	2394.67	2548.8	79.76	154.13	297.52	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
June	14	0.24	2417.94	2548.8	79.76	130.86	130.86	0.01117	0.0032695	430.30	11262.00	85.97	4.8064	1.4068
June	15	0.25	2498.72	2548.8	79.76	50.08	50.08	0.01117	0.0032695	429.33	11226.10	85.96	4.7956	1.4037
June	16	0.25	2546.29	2548.8	79.76	2.51	2.51	0.01117	0.0032695	427.06	11142.65	85.93	4.7703	1.3963
June	17	0.25	2564.75	2548.8	79.76	-15.95	0.00	0.01117	0.0032695	424.72	11056.72	85.89	4.7442	1.3886
June	18	0.25	2546.09	2548.8	79.76	2.71	2.71	0.01117	0.0032695	422.46	10973.54	85.86	4.7188	1.3812
June	19	0.25	2549.88	2548.8	79.76	-1.08	0.00	0.01117	0.0032695	420.11	10887.68	85.83	4.6926	1.3735
June	20	0.25	2547.42	2548.8	79.76	1.38	1.38	0.01117	0.0032695	417.80	10803.24	85.79	4.6668	1.3660
June	21	0.25	2546.52	2548.8	79.76	2.28	2.28	0.01117	0.0032695	415.50	10719.72	85.76	4.6412	1.3585
June	22	0.25	2585.64	2548.8	79.76	-36.84	0.00	0.01117	0.0032695	413.15	10633.96	85.73	4.6148	1.3508
June	23	0.26	2609.81	2548.8	79.76	-61.01	0.00	0.01117	0.0032695	410.78	10548.23	85.69	4.5884	1.3430
June	24	0.26	2601.85	2548.8	79.76	-53.05	0.00	0.01117	0.0032695	408.41	10462.54	85.66	4.5620	1.3353
June	25	0.25	2539.06	2548.8	79.76	9.74	9.74	0.01117	0.0032695	406.31	10386.63	85.63	4.5385	1.3284
June	26	0.25	2527.42	2548.8	79.76	21.38	21.38	0.01117	0.0032695	404.53	10322.38	85.60	4.5185	1.3226
June	27	0.25	2487.06	2548.8	79.76	61.74	61.74	0.01117	0.0032695	403.86	10298.51	85.59	4.5111	1.3204
June	28	0.25	2487.79	2548.8	79.76	61.01	61.01	0.01117	0.0032695	403.18	10273.93	85.58	4.5035	1.3182
June	29	0.24	2463.17	2548.8	79.76	85.63	85.63	0.01117	0.0032695	403.18	10273.98	85.58	4.5035	1.3182
June	30	0.24	2483.13	2548.8	79.76	65.67	65.67	0.01117	0.0032695	402.63	10254.07	85.57	4.4973	1.3164
July	1	0.25	2489.85	2548.8	77.19	58.95	58.95	0.01156129	0.003384	401.95	10229.81	83.19	4.6471	1.3602
July	2	0.24	2465.08	2548.8	77.19	83.72	83.72	0.01156129	0.003384	401.96	10230.34	83.19	4.6472	1.3602
July	3	0.24	2449.93	2548.8	77.19	98.87	98.87	0.01156129	0.003384	402.40	10246.02	83.20	4.6523	1.3617
July	4	0.24	2430.90	2548.8	77.19	117.90	117.90	0.01156129	0.003384	403.37	10280.71	83.22	4.6634	1.3650
July	5	0.24	2469.86	2548.8	77.19	78.94	78.94	0.01156129	0.003384	403.25	10276.44	83.21	4.6621	1.3646

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
July	6	0.24	2468.80	2548.8	77.19	80.00	80.00	0.01156129	0.003384	403.16	10273.22	83.21	4.6610	1.3643
July	7	0.24	2475.79	2548.8	77.19	73.01	73.01	0.01156129	0.003384	402.87	10263.02	83.21	4.6578	1.3633
July	8	0.24	2477.47	2548.8	77.19	71.33	71.33	0.01156129	0.003384	402.54	10251.14	83.20	4.6539	1.3622
July	9	0.25	2504.45	2548.8	77.19	44.35	44.35	0.01156129	0.003384	401.46	10212.29	83.19	4.6414	1.3585
July	10	0.24	2458.78	2548.8	77.19	90.02	90.02	0.01156129	0.003384	401.65	10219.12	83.19	4.6436	1.3592
July	11	0.24	2432.65	2548.8	77.19	116.15	116.15	0.01156129	0.003384	402.57	10252.08	83.20	4.6542	1.3623
July	12	0.24	2430.17	2548.8	77.19	118.63	118.63	0.01156129	0.003384	403.56	10287.51	83.22	4.6656	1.3656
July	13	0.24	2425.00	2548.8	77.19	123.80	123.80	0.01156129	0.003384	404.68	10328.09	83.24	4.6787	1.3694
July	14	0.24	2459.92	2548.8	77.19	88.88	88.88	0.01156129	0.003384	404.84	10333.73	83.24	4.6805	1.3700
July	15	0.24	2473.93	2548.8	77.19	74.87	74.87	0.01156129	0.003384	404.61	10325.36	83.23	4.6778	1.3692
July	16	0.24	2473.35	2548.8	77.19	75.45	75.45	0.01156129	0.003384	404.39	10317.57	83.23	4.6753	1.3685
July	17	0.24	2447.11	2548.8	77.19	101.69	101.69	0.01156129	0.003384	404.90	10336.04	83.24	4.6812	1.3702
July	18	0.24	2458.05	2548.8	77.19	90.75	90.75	0.01156129	0.003384	405.11	10343.55	83.24	4.6836	1.3709
July	19	0.24	2434.55	2548.8	77.19	114.25	114.25	0.01156129	0.003384	405.97	10374.56	83.25	4.6936	1.3738
July	20	0.24	2480.62	2548.8	77.19	68.18	68.18	0.01156129	0.003384	405.56	10359.48	83.25	4.6887	1.3724
July	21	0.25	2515.51	2548.8	77.19	33.29	33.29	0.01156129	0.003384	404.17	10309.52	83.23	4.6727	1.3677
July	22	0.25	2570.23	2548.8	77.19	-21.43	0.00	0.01156129	0.003384	401.85	10226.29	83.19	4.6459	1.3599
July	23	0.26	2602.72	2548.8	77.19	-53.92	0.00	0.01156129	0.003384	399.53	10143.10	83.16	4.6191	1.3520
July	24	0.26	2600.38	2548.8	77.19	-51.58	0.00	0.01156129	0.003384	397.21	10059.94	83.12	4.5922	1.3441
July	25	0.25	2557.67	2548.8	77.19	-8.87	0.00	0.01156129	0.003384	394.88	9976.82	83.09	4.5653	1.3363
July	26	0.25	2535.61	2548.8	77.19	13.19	13.19	0.01156129	0.003384	392.91	9906.92	83.06	4.5426	1.3296
July	27	0.25	2554.67	2548.8	77.19	-5.87	0.00	0.01156129	0.003384	390.57	9823.86	83.02	4.5155	1.3217

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
July	28	0.25	2533.70	2548.8	77.19	15.10	15.10	0.01156129	0.003384	388.66	9755.94	83.00	4.4934	1.3152
July	29	0.25	2536.45	2548.8	77.19	12.35	12.35	0.01156129	0.003384	386.66	9685.29	82.97	4.4703	1.3085
July	30	0.25	2512.98	2548.8	77.19	35.82	35.82	0.01156129	0.003384	385.33	9638.15	82.95	4.4549	1.3039
July	31	0.25	2504.60	2548.8	77.19	44.20	44.20	0.01156129	0.003384	384.23	9599.40	82.93	4.4421	1.3002
August	1	0.24	2419.53	2548.8	77.19	129.27	129.27	0.00906129	0.0026522	385.58	9646.98	81.70	3.4938	1.0226
August	2	0.23	2370.11	2548.8	77.19	178.69	178.69	0.00906129	0.0026522	388.32	9743.96	81.74	3.5187	1.0299
August	3	0.23	2327.16	2548.8	77.19	221.64	221.64	0.00906129	0.0026522	392.26	9883.86	81.78	3.5544	1.0404
August	4	0.23	2302.93	2548.8	77.19	245.87	245.87	0.00906129	0.0026522	396.87	10047.95	81.84	3.5962	1.0526
August	5	0.22	2282.51	2548.8	77.19	266.29	266.29	0.00906129	0.0026522	402.02	10232.41	81.90	3.6428	1.0663
August	6	0.22	2236.18	2548.8	77.19	312.62	297.52	0.00906129	0.0026522	408.01	10448.04	81.97	3.6971	1.0821
August	7	0.22	2225.65	2548.8	77.19	323.15	297.52	0.00906129	0.0026522	413.96	10663.59	82.04	3.7510	1.0979
August	8	0.22	2208.22	2548.8	77.19	340.58	297.52	0.00906129	0.0026522	419.87	10879.07	82.11	3.8046	1.1136
August	9	0.22	2182.68	2548.8	77.19	366.12	297.52	0.00906129	0.0026522	425.75	11094.49	82.17	3.8579	1.1292
August	10	0.21	2120.61	2548.8	77.19	428.19	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	11	0.21	2144.83	2548.8	77.19	403.97	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	12	0.21	2132.90	2548.8	77.19	415.90	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	13	0.21	2105.39	2548.8	77.19	443.41	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	14	0.21	2087.19	2548.8	77.19	461.61	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	15	0.20	2066.91	2548.8	77.19	481.89	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	16	0.20	2060.05	2548.8	77.19	488.75	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	17	0.20	2028.21	2548.8	77.19	520.59	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	18	0.20	1988.41	2548.8	77.19	560.39	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet 3.8991	seepage losses acre-feet 1.1413
August	19	0.19	1967.42	2548.8	77.19	581.38	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	20	0.19	1924.40	2548.8	77.19	624.40	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	21	0.18	1868.08	2548.8	77.19	680.72	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	22	0.18	1839.31	2548.8	77.19	709.49	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	23	0.18	1824.58	2548.8	77.19	724.22	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	24	0.18	1792.55	2548.8	77.19	756.25	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	25	0.17	1763.70	2548.8	77.19	785.10	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	26	0.17	1748.20	2548.8	77.19	800.60	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	27	0.17	1692.17	2548.8	77.19	856.63	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	28	0.16	1659.85	2548.8	77.19	888.95	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	29	0.16	1615.67	2548.8	77.19	933.13	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	30	0.16	1611.69	2548.8	77.19	937.11	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
August	31	0.16	1581.37	2548.8	77.19	967.43	297.52	0.00906129	0.0026522	430.30	11262.00	82.23	3.8991	1.1413
September	1	0.15	1527.40	2548.8	79.76	1021.40	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	2	0.15	1487.33	2548.8	79.76	1061.47	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	3	0.14	1436.26	2548.8	79.76	1112.54	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	4	0.14	1396.96	2548.8	79.76	1151.84	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	5	0.13	1348.48	2548.8	79.76	1200.32	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	6	0.13	1347.69	2548.8	79.76	1201.11	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	7	0.13	1320.67	2548.8	79.76	1228.13	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	8	0.13	1278.79	2548.8	79.76	1270.01	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	9	0.12	1251.87	2548.8	79.76	1296.93	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 430.299874	End day storage acre-feet 11262	total res. losses acre-feet 7572.82	evaporation losses acre-feet	seepage losses acre-feet
September	10	0.12	1213.20	2548.8	79.76	1335.60	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	11	0.12	1186.18	2548.8	79.76	1362.62	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	12	0.11	1155.37	2548.8	79.76	1393.43	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	13	0.11	1135.01	2548.8	79.76	1413.79	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	14	0.11	1102.65	2548.8	79.76	1446.15	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	15	0.11	1074.20	2548.8	79.76	1474.60	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	16	0.10	1042.72	2548.8	79.76	1506.08	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	17	0.10	1023.20	2548.8	79.76	1525.60	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	18	0.10	1011.90	2548.8	79.76	1536.90	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	19	0.10	985.72	2548.8	79.76	1563.08	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	20	0.09	957.86	2548.8	79.76	1590.94	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	21	0.09	948.76	2548.8	79.76	1600.04	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	22	0.09	948.81	2548.8	79.76	1599.99	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	23	0.09	954.74	2548.8	79.76	1594.06	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	24	0.09	961.87	2548.8	79.76	1586.93	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	25	0.09	944.43	2548.8	79.76	1604.37	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	26	0.09	909.57	2548.8	79.76	1639.23	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	27	0.09	877.28	2548.8	79.76	1671.52	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	28	0.08	856.54	2548.8	79.76	1692.26	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	29	0.08	820.85	2548.8	79.76	1727.95	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
September	30	0.08	824.09	2548.8	79.76	1724.71	297.52	0.00751	0.0021982	430.30	11262.00	83.94	3.2316	0.9459
October	1	0.08	805.92	2548.8	61.75	1742.88	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor-Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre	End day storage acre-feet	total res. losses acre-feet	evaporation losses acre-feet	seepage losses acre-feet
										430.299874	11262	7572.82		
October	2	0.08	783.23	2548.8	61.75	1765.57	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	3	0.07	751.22	2548.8	61.75	1797.58	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	4	0.07	716.34	2548.8	61.75	1832.46	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	5	0.07	688.85	2548.8	61.75	1859.95	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	6	0.07	671.17	2548.8	61.75	1877.63	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	7	0.06	653.20	2548.8	61.75	1895.60	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	8	0.06	636.49	2548.8	61.75	1912.31	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	9	0.06	641.66	2548.8	61.75	1907.14	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	10	0.06	602.36	2548.8	61.75	1946.44	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	11	0.06	591.73	2548.8	61.75	1957.07	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	12	0.06	569.54	2548.8	61.75	1979.26	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	13	0.05	557.67	2548.8	61.75	1991.13	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
October	14	0.05	535.63	2548.8	61.75	2013.17	297.52	0.00439032	0.001285	430.30	11262.00	64.19	1.8892	0.5530
		0.05				23928						25046.809	865.482333	253.32668

- Notes:
1. Evap Trans = Peak EvaporTranspiration for an average 10 day period for year 2000. Data from Keller- Bleisner Engineering
  2. NIIP demand = Niip water demand based on downstream acreage, evapotranspiration, coveyance and irrigation efficiency (NIIP demand = ET\*downstream acreage/coveyance efficiency/irrigation efficiency)
  3. NIIP Canal availability = Design flowrate for system constraint between Mp45.7-Burnham, 1285 CFS

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2020

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 11262 acre feet  
 total diversion required NGWSP 25047 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre	End day storage acre-feet	total res. losses acre-feet	evaporation losses acre-feet	seepage losses acre-feet
										430.299874	11262	7572.82		

4. NGWSP demand = Daily demand based on existing NTUA demand pattern on Navajo Nation, ref. 4.
  5. NIIP surplus = Water available after NIIP demand is met. (NIIP surplus = NIIP Canal availability - NIIP demand).
  6. Inflow into Moncisco = Water flow into reservoir(Inflow into Moncisco = NIIP surplus to a maximum of 150 cfs)
  7. Evaporation loss = average evaporation loss for Navajo Reservoir.
  8. Seepage loss = seepage loss for Moncisco Reservoir from (ref. 2 page 10).
  9. Surface area = water surface area of reservoir. Equation based on area capacity curve. (surface area = .577\*reservoir volume^.709) with standard deviation of .999
  10. End of day storage = Storage of current day including inflow, outflow and losses.
  11. total losses = Reservoir losses (total losses = NGWSP demand + evaporation + seepage)
  12. NGWSP diversion = Required diversion for NGWSP which includes conveyance efficiency and losses in the reservoir
- There are no losses assumed for conveyance from Navajo Dam to Moncisco reservoir because NIIP's current operations reflect total losses and additional water would not increase existing losses.

Reference: 1. "Navajo Indian Irrigation Project, Gallegos Needs and Cost Assessment", May 1995, Keller-Bleisner Engineering  
 2. "Technical Memorandum No. GG-8311-2, "Gallegos Dam, Reconnaissance Design Summary", February 1995, Technical Service Center, Bureau of Reclamation  
 3. Navajo Nation Department of Water Resources.  
 4. Navajo Tribal Utility Authority memorandum.



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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
October	15	0.05	525.59	2548.8	97.46	2023.21	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	16	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	539.50	15493.47	100.52	2.3686	0.6933
October	17	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	537.02	15392.95	100.50	2.3577	0.6901
October	18	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	534.53	15292.45	100.49	2.3467	0.6869
October	19	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	532.03	15191.96	100.47	2.3358	0.6837
October	20	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	529.54	15091.48	100.46	2.3248	0.6805
October	21	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	527.04	14991.02	100.45	2.3139	0.6773
October	22	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	524.53	14890.58	100.43	2.3029	0.6740
October	23	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	522.02	14790.14	100.42	2.2918	0.6708
October	24	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	519.50	14689.73	100.40	2.2808	0.6676
October	25	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	516.98	14589.32	100.39	2.2697	0.6643
October	26	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	514.46	14488.93	100.38	2.2586	0.6611
October	27	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	511.93	14388.56	100.36	2.2475	0.6579
October	28	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	509.40	14288.20	100.35	2.2364	0.6546
October	29	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	506.86	14187.85	100.33	2.2253	0.6513
October	30	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	504.31	14087.52	100.32	2.2141	0.6481
October	31	0	0.00	2548.8	97.46	0.00	0.00	0.00439032	0.001285	501.76	13987.20	100.30	2.2029	0.6448
November	1	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	499.48	13897.64	89.55	1.1089	0.3246
November	2	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	497.20	13808.09	89.54	1.1038	0.3231
November	3	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	494.91	13718.55	89.54	1.0987	0.3216
November	4	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	492.62	13629.02	89.53	1.0936	0.3201
November	5	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	490.32	13539.49	89.52	1.0885	0.3186

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity = 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evaporat- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
November	6	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	488.02	13449.96	89.52	1.0834	0.3171
November	7	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	485.72	13360.45	89.51	1.0783	0.3156
November	8	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	483.41	13270.94	89.50	1.0732	0.3141
November	9	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	481.09	13181.43	89.50	1.0680	0.3126
November	10	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	478.78	13091.94	89.49	1.0629	0.3111
November	11	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	476.45	13002.45	89.48	1.0577	0.3096
November	12	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	474.13	12912.96	89.48	1.0526	0.3081
November	13	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	471.79	12823.49	89.47	1.0474	0.3066
November	14	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	469.46	12734.02	89.46	1.0422	0.3051
November	15	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	467.12	12644.55	89.46	1.0370	0.3035
November	16	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	464.77	12555.10	89.45	1.0318	0.3020
November	17	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	462.42	12465.65	89.44	1.0266	0.3005
November	18	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	460.07	12376.20	89.44	1.0213	0.2989
November	19	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	457.71	12286.77	89.43	1.0161	0.2974
November	20	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	455.34	12197.34	89.42	1.0109	0.2959
November	21	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	452.97	12107.92	89.42	1.0056	0.2943
November	22	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	450.60	12018.50	89.41	1.0003	0.2928
November	23	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	448.22	11929.09	89.40	0.9950	0.2913
November	24	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	445.83	11839.69	89.40	0.9898	0.2897
November	25	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	443.45	11750.29	89.39	0.9844	0.2881
November	26	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	441.05	11660.90	89.38	0.9791	0.2866
November	27	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	438.65	11571.52	89.37	0.9738	0.2850

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
November	28	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	436.25	11482.15	89.37	0.9685	0.2835
November	29	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	433.84	11392.78	89.36	0.9631	0.2819
November	30	0	0.00	2548.8	88.12	0.00	0.00	0.00222	0.0006498	431.42	11303.42	89.35	0.9578	0.2803
December	1	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	429.09	11217.28	86.13	0.6644	0.1945
December	2	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	426.75	11131.15	86.13	0.6608	0.1934
December	3	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	424.41	11045.02	86.12	0.6571	0.1923
December	4	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	422.06	10958.90	86.12	0.6535	0.1913
December	5	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	419.70	10872.78	86.11	0.6499	0.1902
December	6	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	417.34	10786.67	86.11	0.6462	0.1891
December	7	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	414.98	10700.56	86.10	0.6425	0.1881
December	8	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	412.61	10614.45	86.10	0.6389	0.1870
December	9	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	410.23	10528.35	86.09	0.6352	0.1859
December	10	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	407.85	10442.26	86.09	0.6315	0.1848
December	11	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	405.46	10356.17	86.09	0.6278	0.1838
December	12	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	403.07	10270.08	86.08	0.6241	0.1827
December	13	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	400.67	10184.00	86.08	0.6204	0.1816
December	14	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	398.27	10097.93	86.07	0.6167	0.1805
December	15	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	395.86	10011.86	86.07	0.6129	0.1794
December	16	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	393.44	9925.79	86.06	0.6092	0.1783
December	17	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	391.02	9839.73	86.06	0.6055	0.1772
December	18	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	388.59	9753.67	86.05	0.6017	0.1761
December	19	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	386.16	9667.62	86.05	0.5979	0.1750

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity = 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size = 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
December	20	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	383.72	9581.58	86.04	0.5941	0.1739
December	21	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	381.27	9495.53	86.04	0.5904	0.1728
December	22	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	378.82	9409.50	86.03	0.5866	0.1717
December	23	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	376.36	9323.47	86.03	0.5828	0.1706
December	24	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	373.90	9237.44	86.02	0.5789	0.1695
December	25	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	371.42	9151.42	86.02	0.5751	0.1683
December	26	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	368.95	9065.40	86.01	0.5713	0.1672
December	27	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	366.46	8979.39	86.01	0.5674	0.1661
December	28	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	363.97	8893.38	86.00	0.5636	0.1650
December	29	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	361.47	8807.38	86.00	0.5597	0.1638
December	30	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	358.96	8721.38	85.99	0.5558	0.1627
December	31	0	0.00	2548.8	85.27	0.00	0.00	0.00154839	0.0004532	356.45	8635.39	85.99	0.5519	0.1615
January	1	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	353.93	8549.41	85.98	0.5446	0.1594
January	2	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	351.40	8463.43	85.97	0.5407	0.1583
January	3	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	348.87	8377.46	85.97	0.5368	0.1571
January	4	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	346.33	8291.49	85.96	0.5329	0.1560
January	5	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	343.78	8205.53	85.96	0.5290	0.1548
January	6	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	341.22	8119.57	85.95	0.5250	0.1537
January	7	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	338.66	8033.62	85.95	0.5211	0.1525
January	8	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	336.08	7947.67	85.94	0.5171	0.1514
January	9	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	333.50	7861.73	85.94	0.5132	0.1502
January	10	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	330.91	7775.79	85.93	0.5092	0.1490

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity = 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size = 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
January	11	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	328.32	7689.86	85.93	0.5052	0.1479
January	12	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	325.71	7603.93	85.92	0.5012	0.1467
January	13	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	323.10	7518.01	85.92	0.4972	0.1455
January	14	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	320.47	7432.10	85.91	0.4931	0.1443
January	15	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	317.84	7346.19	85.91	0.4891	0.1432
January	16	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	315.20	7260.28	85.90	0.4850	0.1420
January	17	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	312.56	7174.38	85.90	0.4809	0.1408
January	18	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	309.90	7088.48	85.89	0.4768	0.1396
January	19	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	307.23	7002.59	85.88	0.4727	0.1384
January	20	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	304.55	6916.71	85.88	0.4686	0.1372
January	21	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	301.87	6830.83	85.87	0.4645	0.1360
January	22	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	299.17	6744.96	85.87	0.4603	0.1347
January	23	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	296.47	6659.09	85.86	0.4562	0.1335
January	24	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	293.75	6573.22	85.86	0.4520	0.1323
January	25	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	291.03	6487.37	85.85	0.4478	0.1311
January	26	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	288.29	6401.51	85.85	0.4436	0.1298
January	27	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	285.54	6315.67	85.84	0.4394	0.1286
January	28	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	282.79	6229.82	85.84	0.4351	0.1274
January	29	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	280.02	6143.99	85.83	0.4309	0.1261
January	30	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	277.24	6058.16	85.83	0.4266	0.1249
January	31	0	0.00	2548.8	85.27	0.00	0.00	0.00153871	0.0004504	274.45	5972.33	85.82	0.4223	0.1236
February	1	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	271.78	5890.66	81.67	0.5756	0.1685

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
February	2	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	269.11	5808.99	81.66	0.5699	0.1668
February	3	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	266.42	5727.33	81.65	0.5642	0.1652
February	4	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	263.72	5645.68	81.64	0.5585	0.1635
February	5	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	261.01	5564.04	81.64	0.5528	0.1618
February	6	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	258.29	5482.40	81.63	0.5470	0.1601
February	7	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	255.56	5400.77	81.62	0.5412	0.1584
February	8	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	252.81	5319.15	81.61	0.5354	0.1567
February	9	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	250.06	5237.53	81.61	0.5296	0.1550
February	10	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	247.29	5155.92	81.60	0.5237	0.1533
February	11	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	244.51	5074.32	81.59	0.5178	0.1516
February	12	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	241.71	4992.73	81.58	0.5119	0.1498
February	13	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	238.90	4911.15	81.58	0.5060	0.1481
February	14	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	236.08	4829.57	81.57	0.5000	0.1463
February	15	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	233.25	4748.00	81.56	0.4940	0.1446
February	16	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	230.40	4666.44	81.55	0.4880	0.1428
February	17	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	227.54	4584.89	81.55	0.4819	0.1411
February	18	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	224.66	4503.34	81.54	0.4758	0.1393
February	19	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	221.77	4421.80	81.53	0.4697	0.1375
February	20	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	218.86	4340.27	81.52	0.4635	0.1357
February	21	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	215.94	4258.75	81.51	0.4573	0.1339
February	22	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	213.00	4177.24	81.51	0.4511	0.1320
February	23	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	210.05	4095.73	81.50	0.4449	0.1302

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
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 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
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 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
February	24	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	207.08	4014.23	81.49	0.4386	0.1284
February	25	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	204.09	3932.74	81.48	0.4322	0.1265
February	26	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	201.08	3851.26	81.47	0.4259	0.1246
February	27	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	198.05	3769.79	81.47	0.4195	0.1228
February	28	0	0.00	2548.8	80.92	0.00	0.00	0.00211786	0.0006199	195.01	3688.32	81.46	0.4130	0.1209
March	1	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	201.97	3875.20	110.67	0.8000	0.2342
March	2	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	208.82	4062.05	110.71	0.8272	0.2421
March	3	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	215.59	4248.86	110.74	0.8540	0.2500
March	4	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	222.26	4435.64	110.78	0.8804	0.2577
March	5	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	228.86	4622.39	110.81	0.9066	0.2654
March	6	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	235.37	4809.09	110.84	0.9324	0.2729
March	7	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	241.82	4995.77	110.88	0.9579	0.2804
March	8	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	248.19	5182.41	110.91	0.9831	0.2878
March	9	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	254.49	5369.03	110.94	1.0081	0.2951
March	10	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	260.73	5555.60	110.97	1.0328	0.3023
March	11	0.01	101.48	2548.8	109.64	2447.32	297.52	0.00396129	0.0011595	266.91	5742.15	111.00	1.0573	0.3095
March	12	0.02	223.36	2548.8	109.64	2325.44	297.52	0.00396129	0.0011595	273.02	5928.66	111.04	1.0815	0.3166
March	13	0.02	236.76	2548.8	109.64	2312.04	297.52	0.00396129	0.0011595	279.09	6115.15	111.07	1.1055	0.3236
March	14	0.02	245.09	2548.8	109.64	2303.71	297.52	0.00396129	0.0011595	285.09	6301.60	111.10	1.1293	0.3306
March	15	0.02	253.24	2548.8	109.64	2295.56	297.52	0.00396129	0.0011595	291.05	6488.02	111.13	1.1529	0.3375
March	16	0.03	256.91	2548.8	109.64	2291.89	297.52	0.00396129	0.0011595	296.95	6674.41	111.16	1.1763	0.3443
March	17	0.02	249.43	2548.8	109.64	2299.37	297.52	0.00396129	0.0011595	302.81	6860.77	111.19	1.1995	0.3511

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre	End day storage acre-feet	total res. losses acre-feet	evaporation losses acre-feet	seepage losses acre-feet
										541.979303	15594	11904.72		
March	18	0.02	249.33	2548.8	109.64	2299.47	297.52	0.00396129	0.0011595	308.61	7047.11	111.22	1.2225	0.3578
March	19	0.02	250.62	2548.8	109.64	2298.18	297.52	0.00396129	0.0011595	314.38	7233.41	111.25	1.2453	0.3645
March	20	0.03	264.15	2548.8	109.64	2284.65	297.52	0.00396129	0.0011595	320.09	7419.68	111.28	1.2680	0.3711
March	21	0.03	280.02	2548.8	109.64	2268.78	297.52	0.00396129	0.0011595	325.77	7605.92	111.31	1.2905	0.3777
March	22	0.03	295.88	2548.8	109.64	2252.92	297.52	0.00396129	0.0011595	331.41	7792.13	111.33	1.3128	0.3843
March	23	0.03	303.40	2548.8	109.64	2245.40	297.52	0.00396129	0.0011595	337.00	7978.32	111.36	1.3350	0.3907
March	24	0.03	293.66	2548.8	109.64	2255.14	297.52	0.00396129	0.0011595	342.56	8164.47	111.39	1.3570	0.3972
March	25	0.03	295.73	2548.8	109.64	2253.07	297.52	0.00396129	0.0011595	348.08	8350.60	111.42	1.3788	0.4036
March	26	0.03	296.15	2548.8	109.64	2252.65	297.52	0.00396129	0.0011595	353.56	8536.70	111.45	1.4005	0.4099
March	27	0.03	297.63	2548.8	109.64	2251.17	297.52	0.00396129	0.0011595	359.00	8722.77	111.48	1.4221	0.4163
March	28	0.03	304.21	2548.8	109.64	2244.59	297.52	0.00396129	0.0011595	364.42	8908.82	111.50	1.4436	0.4225
March	29	0.03	321.19	2548.8	109.64	2227.61	297.52	0.00396129	0.0011595	369.80	9094.83	111.53	1.4649	0.4288
March	30	0.03	334.80	2548.8	109.64	2214.00	297.52	0.00396129	0.0011595	375.14	9280.82	111.56	1.4860	0.4350
March	31	0.03	341.05	2548.8	109.64	2207.75	297.52	0.00396129	0.0011595	380.45	9466.78	111.59	1.5071	0.4411
April	1	0.04	363.06	2548.8	88.12	2185.74	297.52	0.00645	0.0018879	386.31	9673.01	91.34	2.4917	0.7293
April	2	0.04	383.85	2548.8	88.12	2164.95	297.52	0.00645	0.0018879	392.13	9879.19	91.39	2.5293	0.7403
April	3	0.04	422.13	2548.8	88.12	2126.67	297.52	0.00645	0.0018879	397.92	10085.33	91.43	2.5666	0.7512
April	4	0.04	438.63	2548.8	88.12	2110.17	297.52	0.00645	0.0018879	403.66	10291.41	91.48	2.6036	0.7621
April	5	0.05	477.91	2548.8	88.12	2070.89	297.52	0.00645	0.0018879	409.38	10497.45	91.53	2.6405	0.7729
April	6	0.05	522.80	2548.8	88.12	2026.00	297.52	0.00645	0.0018879	415.06	10703.44	91.58	2.6771	0.7836
April	7	0.05	544.01	2548.8	88.12	2004.79	297.52	0.00645	0.0018879	420.70	10909.38	91.62	2.7135	0.7943
April	8	0.06	569.69	2548.8	88.12	1979.11	297.52	0.00645	0.0018879	426.32	11115.28	91.67	2.7497	0.8049

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
April	9	0.06	606.45	2548.8	88.12	1942.35	297.52	0.00645	0.0018879	431.90	11321.12	91.72	2.7858	0.8154
April	10	0.06	652.83	2548.8	88.12	1895.97	297.52	0.00645	0.0018879	437.45	11526.93	91.76	2.8216	0.8259
April	11	0.06	652.92	2548.8	88.12	1895.88	297.52	0.00645	0.0018879	442.97	11732.68	91.81	2.8572	0.8363
April	12	0.07	671.01	2548.8	88.12	1877.79	297.52	0.00645	0.0018879	448.47	11938.39	91.86	2.8926	0.8467
April	13	0.07	708.25	2548.8	88.12	1840.55	297.52	0.00645	0.0018879	453.93	12144.05	91.90	2.9279	0.8570
April	14	0.07	720.76	2548.8	88.12	1828.04	297.52	0.00645	0.0018879	459.37	12349.67	91.95	2.9629	0.8672
April	15	0.07	730.75	2548.8	88.12	1818.05	297.52	0.00645	0.0018879	464.78	12555.25	91.99	2.9978	0.8775
April	16	0.07	751.11	2548.8	88.12	1797.69	297.52	0.00645	0.0018879	470.16	12760.77	92.04	3.0325	0.8876
April	17	0.08	783.03	2548.8	88.12	1765.77	297.52	0.00645	0.0018879	475.51	12966.26	92.08	3.0671	0.8977
April	18	0.08	796.70	2548.8	88.12	1752.10	297.52	0.00645	0.0018879	480.84	13171.69	92.13	3.1014	0.9078
April	19	0.08	798.78	2548.8	88.12	1750.02	297.52	0.00645	0.0018879	486.15	13377.09	92.17	3.1356	0.9178
April	20	0.08	806.57	2548.8	88.12	1742.23	297.52	0.00645	0.0018879	491.42	13582.44	92.21	3.1697	0.9278
April	21	0.08	848.65	2548.8	88.12	1700.15	297.52	0.00645	0.0018879	496.68	13787.74	92.26	3.2036	0.9377
April	22	0.09	880.73	2548.8	88.12	1668.07	297.52	0.00645	0.0018879	501.91	13993.00	92.30	3.2373	0.9476
April	23	0.09	904.47	2548.8	88.12	1644.33	297.52	0.00645	0.0018879	507.12	14198.22	92.34	3.2709	0.9574
April	24	0.09	961.65	2548.8	88.12	1587.15	297.52	0.00645	0.0018879	512.30	14403.40	92.39	3.3044	0.9672
April	25	0.10	998.41	2548.8	88.12	1550.39	297.52	0.00645	0.0018879	517.47	14608.53	92.43	3.3377	0.9769
April	26	0.10	1018.63	2548.8	88.12	1530.17	297.52	0.00645	0.0018879	522.61	14813.62	92.47	3.3708	0.9866
April	27	0.11	1066.02	2548.8	88.12	1482.78	297.52	0.00645	0.0018879	527.72	15018.66	92.52	3.4038	0.9963
April	28	0.11	1122.37	2548.8	88.12	1426.43	297.52	0.00645	0.0018879	532.82	15223.67	92.56	3.4367	1.0059
April	29	0.12	1171.11	2548.8	88.12	1377.69	297.52	0.00645	0.0018879	537.90	15428.63	92.60	3.4694	1.0155
April	30	0.12	1226.60	2548.8	88.12	1322.20	297.52	0.00645	0.0018879	541.98	15594.00	92.63	3.4958	1.0232

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet 4.8394	seepage losses acre-feet 1.4165
May	1	0.12	1265.64	2548.8	109.64	1283.16	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	2	0.13	1300.61	2548.8	109.64	1248.19	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	3	0.13	1300.31	2548.8	109.64	1248.49	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	4	0.13	1318.14	2548.8	109.64	1230.66	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	5	0.14	1376.92	2548.8	109.64	1171.88	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	6	0.14	1441.43	2548.8	109.64	1107.37	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	7	0.14	1462.47	2548.8	109.64	1086.33	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	8	0.14	1469.37	2548.8	109.64	1079.43	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	9	0.15	1510.27	2548.8	109.64	1038.53	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	10	0.15	1501.31	2548.8	109.64	1047.49	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	11	0.15	1523.70	2548.8	109.64	1025.10	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	12	0.15	1558.62	2548.8	109.64	990.18	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	13	0.16	1611.11	2548.8	109.64	937.69	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	14	0.16	1593.87	2548.8	109.64	954.93	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	15	0.15	1556.73	2548.8	109.64	992.07	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	16	0.15	1517.10	2548.8	109.64	1031.70	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	17	0.15	1517.17	2548.8	109.64	1031.63	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	18	0.15	1559.64	2548.8	109.64	989.16	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	19	0.15	1529.94	2548.8	109.64	1018.86	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	20	0.15	1499.70	2548.8	109.64	1049.10	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	21	0.14	1459.90	2548.8	109.64	1088.90	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	22	0.14	1435.35	2548.8	109.64	1113.45	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
May	23	0.14	1439.19	2548.8	109.64	1109.61	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	24	0.15	1517.44	2548.8	109.64	1031.36	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	25	0.16	1576.95	2548.8	109.64	971.85	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	26	0.16	1634.12	2548.8	109.64	914.68	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	27	0.16	1651.06	2548.8	109.64	897.74	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	28	0.16	1646.39	2548.8	109.64	902.41	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	29	0.17	1694.86	2548.8	109.64	853.94	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	30	0.18	1792.47	2548.8	109.64	756.33	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
May	31	0.19	1902.00	2548.8	109.64	646.80	297.52	0.00892903	0.0026135	541.98	15594.00	115.89	4.8394	1.4165
June	1	0.20	1979.82	2548.8	125.88	568.98	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	2	0.20	2022.21	2548.8	125.88	526.59	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	3	0.20	2028.09	2548.8	125.88	520.71	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	4	0.20	2061.52	2548.8	125.88	487.28	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	5	0.21	2082.50	2548.8	125.88	466.30	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	6	0.21	2137.86	2548.8	125.88	410.94	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	7	0.22	2225.42	2548.8	125.88	323.38	297.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	8	0.23	2291.13	2548.8	125.88	257.67	257.67	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	9	0.23	2336.28	2548.8	125.88	212.52	212.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	10	0.23	2344.93	2548.8	125.88	203.87	203.87	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	11	0.23	2362.28	2548.8	125.88	186.52	186.52	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	12	0.23	2365.49	2548.8	125.88	183.31	183.31	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720
June	13	0.24	2394.67	2548.8	125.88	154.13	154.13	0.01117	0.0032695	541.98	15594.00	133.71	6.0539	1.7720

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre	End day storage acre-feet	total res. losses acre-feet	evaporation losses acre-feet	seepage losses acre-feet
		(1)								541.979303	15594	11904.72		
June	14	0.24	2417.94	2548.8	125.88	130.86	130.86	0.01117	0.0032695	541.91	15591.15	133.70	6.0531	1.7717
June	15	0.25	2498.72	2548.8	125.88	50.08	50.08	0.01117	0.0032695	539.85	15507.52	133.68	6.0301	1.7650
June	16	0.25	2546.29	2548.8	125.88	2.51	2.51	0.01117	0.0032695	536.61	15376.36	133.63	5.9939	1.7544
June	17	0.25	2564.75	2548.8	125.88	-15.95	0.00	0.01117	0.0032695	533.29	15242.73	133.58	5.9569	1.7436
June	18	0.25	2546.09	2548.8	125.88	2.71	2.71	0.01117	0.0032695	530.04	15111.86	133.53	5.9206	1.7330
June	19	0.25	2549.88	2548.8	125.88	-1.08	0.00	0.01117	0.0032695	526.72	14978.32	133.49	5.8835	1.7221
June	20	0.25	2547.42	2548.8	125.88	1.38	1.38	0.01117	0.0032695	523.42	14846.22	133.44	5.8466	1.7113
June	21	0.25	2546.52	2548.8	125.88	2.28	2.28	0.01117	0.0032695	520.14	14715.06	133.39	5.8099	1.7006
June	22	0.25	2585.64	2548.8	125.88	-36.84	0.00	0.01117	0.0032695	516.79	14581.67	133.34	5.7726	1.6896
June	23	0.26	2609.81	2548.8	125.88	-61.01	0.00	0.01117	0.0032695	513.44	14448.33	133.29	5.7351	1.6787
June	24	0.26	2601.85	2548.8	125.88	-53.05	0.00	0.01117	0.0032695	510.07	14315.03	133.25	5.6975	1.6677
June	25	0.25	2539.06	2548.8	125.88	9.74	9.74	0.01117	0.0032695	506.95	14191.53	133.20	5.6626	1.6574
June	26	0.25	2527.42	2548.8	125.88	21.38	21.38	0.01117	0.0032695	504.11	14079.70	133.16	5.6310	1.6482
June	27	0.25	2487.06	2548.8	125.88	61.74	61.74	0.01117	0.0032695	502.30	14008.28	133.13	5.6107	1.6422
June	28	0.25	2487.79	2548.8	125.88	61.01	61.01	0.01117	0.0032695	500.46	13936.16	133.11	5.5902	1.6362
June	29	0.24	2463.17	2548.8	125.88	85.63	85.63	0.01117	0.0032695	499.26	13888.68	133.09	5.5767	1.6323
June	30	0.24	2483.13	2548.8	125.88	65.67	65.67	0.01117	0.0032695	497.54	13821.26	133.06	5.5575	1.6267
July	1	0.25	2489.85	2548.8	121.82	58.95	58.95	0.01156129	0.003384	495.74	13750.96	129.23	5.7314	1.6776
July	2	0.24	2465.08	2548.8	121.82	83.72	83.72	0.01156129	0.003384	494.58	13705.45	129.21	5.7179	1.6736
July	3	0.24	2449.93	2548.8	121.82	98.87	98.87	0.01156129	0.003384	493.80	13675.11	129.20	5.7090	1.6710
July	4	0.24	2430.90	2548.8	121.82	117.90	117.90	0.01156129	0.003384	493.51	13663.81	129.20	5.7056	1.6700
July	5	0.24	2469.86	2548.8	121.82	78.94	78.94	0.01156129	0.003384	492.22	13613.56	129.18	5.6907	1.6657

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
July	6	0.24	2468.80	2548.8	121.82	80.00	80.00	0.01156129	0.003384	490.96	13564.38	129.16	5.6761	1.6614
July	7	0.24	2475.79	2548.8	121.82	73.01	73.01	0.01156129	0.003384	489.52	13508.23	129.14	5.6595	1.6565
July	8	0.24	2477.47	2548.8	121.82	71.33	71.33	0.01156129	0.003384	488.03	13450.43	129.11	5.6423	1.6515
July	9	0.25	2504.45	2548.8	121.82	44.35	44.35	0.01156129	0.003384	485.85	13365.66	129.08	5.6171	1.6441
July	10	0.24	2458.78	2548.8	121.82	90.02	90.02	0.01156129	0.003384	484.84	13326.60	129.07	5.6054	1.6407
July	11	0.24	2432.65	2548.8	121.82	116.15	116.15	0.01156129	0.003384	484.51	13313.68	129.06	5.6016	1.6396
July	12	0.24	2430.17	2548.8	121.82	118.63	118.63	0.01156129	0.003384	484.24	13303.26	129.06	5.5985	1.6387
July	13	0.24	2425.00	2548.8	121.82	123.80	123.80	0.01156129	0.003384	484.11	13298.00	129.05	5.5969	1.6382
July	14	0.24	2459.92	2548.8	121.82	88.88	88.88	0.01156129	0.003384	483.07	13257.82	129.04	5.5849	1.6347
July	15	0.24	2473.93	2548.8	121.82	74.87	74.87	0.01156129	0.003384	481.67	13203.65	129.02	5.5687	1.6300
July	16	0.24	2473.35	2548.8	121.82	75.45	75.45	0.01156129	0.003384	480.28	13150.08	129.00	5.5527	1.6253
July	17	0.24	2447.11	2548.8	121.82	101.69	101.69	0.01156129	0.003384	479.57	13122.78	128.99	5.5445	1.6229
July	18	0.24	2458.05	2548.8	121.82	90.75	90.75	0.01156129	0.003384	478.58	13084.54	128.97	5.5330	1.6195
July	19	0.24	2434.55	2548.8	121.82	114.25	114.25	0.01156129	0.003384	478.20	13069.82	128.97	5.5286	1.6182
July	20	0.24	2480.62	2548.8	121.82	68.18	68.18	0.01156129	0.003384	476.62	13009.03	128.94	5.5104	1.6129
July	21	0.25	2515.51	2548.8	121.82	33.29	33.29	0.01156129	0.003384	474.14	12913.37	128.91	5.4816	1.6045
July	22	0.25	2570.23	2548.8	121.82	-21.43	0.00	0.01156129	0.003384	470.78	12784.47	128.86	5.4428	1.5931
July	23	0.26	2602.72	2548.8	121.82	-53.92	0.00	0.01156129	0.003384	467.41	12655.61	128.80	5.4038	1.5817
July	24	0.26	2600.38	2548.8	121.82	-51.58	0.00	0.01156129	0.003384	464.03	12526.81	128.75	5.3648	1.5703
July	25	0.25	2557.67	2548.8	121.82	-8.87	0.00	0.01156129	0.003384	460.64	12398.05	128.70	5.3256	1.5588
July	26	0.25	2535.61	2548.8	121.82	13.19	13.19	0.01156129	0.003384	457.59	12282.54	128.66	5.2904	1.5485
July	27	0.25	2554.67	2548.8	121.82	-5.87	0.00	0.01156129	0.003384	454.19	12153.88	128.61	5.2510	1.5370

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
July	28	0.25	2533.70	2548.8	121.82	15.10	15.10	0.01156129	0.003384	451.18	12040.38	128.56	5.2162	1.5268
July	29	0.25	2536.45	2548.8	121.82	12.35	12.35	0.01156129	0.003384	448.09	11924.16	128.52	5.1805	1.5163
July	30	0.25	2512.98	2548.8	121.82	35.82	35.82	0.01156129	0.003384	445.62	11831.47	128.48	5.1519	1.5080
July	31	0.25	2504.60	2548.8	121.82	44.20	44.20	0.01156129	0.003384	443.36	11747.19	128.45	5.1258	1.5003
August	1	0.24	2419.53	2548.8	121.82	129.27	129.27	0.00906129	0.0026522	443.42	11749.45	127.01	4.0180	1.1761
August	2	0.23	2370.11	2548.8	121.82	178.69	178.69	0.00906129	0.0026522	444.80	11801.12	127.03	4.0305	1.1797
August	3	0.23	2327.16	2548.8	121.82	221.64	221.64	0.00906129	0.0026522	447.33	11895.72	127.06	4.0534	1.1864
August	4	0.23	2302.93	2548.8	121.82	245.87	245.87	0.00906129	0.0026522	450.49	12014.54	127.10	4.0820	1.1948
August	5	0.22	2282.51	2548.8	121.82	266.29	266.29	0.00906129	0.0026522	454.19	12153.74	127.14	4.1155	1.2046
August	6	0.22	2236.18	2548.8	121.82	312.62	297.52	0.00906129	0.0026522	458.69	12324.12	127.19	4.1563	1.2166
August	7	0.22	2225.65	2548.8	121.82	323.15	297.52	0.00906129	0.0026522	463.18	12494.44	127.24	4.1970	1.2285
August	8	0.22	2208.22	2548.8	121.82	340.58	297.52	0.00906129	0.0026522	467.64	12664.72	127.30	4.2375	1.2403
August	9	0.22	2182.68	2548.8	121.82	366.12	297.52	0.00906129	0.0026522	472.09	12834.94	127.35	4.2778	1.2521
August	10	0.21	2120.61	2548.8	121.82	428.19	297.52	0.00906129	0.0026522	476.52	13005.11	127.40	4.3179	1.2638
August	11	0.21	2144.83	2548.8	121.82	403.97	297.52	0.00906129	0.0026522	480.93	13175.23	127.45	4.3579	1.2755
August	12	0.21	2132.90	2548.8	121.82	415.90	297.52	0.00906129	0.0026522	485.33	13345.29	127.50	4.3977	1.2872
August	13	0.21	2105.39	2548.8	121.82	443.41	297.52	0.00906129	0.0026522	489.70	13515.31	127.56	4.4373	1.2988
August	14	0.21	2087.19	2548.8	121.82	461.61	297.52	0.00906129	0.0026522	494.06	13685.27	127.61	4.4768	1.3104
August	15	0.20	2066.91	2548.8	121.82	481.89	297.52	0.00906129	0.0026522	498.40	13855.18	127.66	4.5162	1.3219
August	16	0.20	2060.05	2548.8	121.82	488.75	297.52	0.00906129	0.0026522	502.73	14025.04	127.71	4.5553	1.3333
August	17	0.20	2028.21	2548.8	121.82	520.59	297.52	0.00906129	0.0026522	507.03	14194.86	127.76	4.5944	1.3448
August	18	0.20	1988.41	2548.8	121.82	560.39	297.52	0.00906129	0.0026522	511.33	14364.62	127.81	4.6333	1.3562

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref. 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet	seepage losses acre-feet
August	19	0.19	1967.42	2548.8	121.82	581.38	297.52	0.00906129	0.0026522	515.60	14534.33	127.86	4.6720	1.3675
August	20	0.19	1924.40	2548.8	121.82	624.40	297.52	0.00906129	0.0026522	519.86	14703.99	127.91	4.7106	1.3788
August	21	0.18	1868.08	2548.8	121.82	680.72	297.52	0.00906129	0.0026522	524.11	14873.60	127.96	4.7491	1.3901
August	22	0.18	1839.31	2548.8	121.82	709.49	297.52	0.00906129	0.0026522	528.33	15043.16	128.01	4.7874	1.4013
August	23	0.18	1824.58	2548.8	121.82	724.22	297.52	0.00906129	0.0026522	532.55	15212.67	128.06	4.8256	1.4124
August	24	0.18	1792.55	2548.8	121.82	756.25	297.52	0.00906129	0.0026522	536.75	15382.13	128.11	4.8636	1.4236
August	25	0.17	1763.70	2548.8	121.82	785.10	297.52	0.00906129	0.0026522	540.93	15551.54	128.16	4.9015	1.4347
August	26	0.17	1748.20	2548.8	121.82	800.60	297.52	0.00906129	0.0026522	541.98	15594.00	128.17	4.9110	1.4375
August	27	0.17	1692.17	2548.8	121.82	856.63	297.52	0.00906129	0.0026522	541.98	15594.00	128.17	4.9110	1.4375
August	28	0.16	1659.85	2548.8	121.82	888.95	297.52	0.00906129	0.0026522	541.98	15594.00	128.17	4.9110	1.4375
August	29	0.16	1615.67	2548.8	121.82	933.13	297.52	0.00906129	0.0026522	541.98	15594.00	128.17	4.9110	1.4375
August	30	0.16	1611.69	2548.8	121.82	937.11	297.52	0.00906129	0.0026522	541.98	15594.00	128.17	4.9110	1.4375
August	31	0.16	1581.37	2548.8	121.82	967.43	297.52	0.00906129	0.0026522	541.98	15594.00	128.17	4.9110	1.4375
September	1	0.15	1527.40	2548.8	125.88	1021.40	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	2	0.15	1487.33	2548.8	125.88	1061.47	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	3	0.14	1436.26	2548.8	125.88	1112.54	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	4	0.14	1396.96	2548.8	125.88	1151.84	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	5	0.13	1348.48	2548.8	125.88	1200.32	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	6	0.13	1347.69	2548.8	125.88	1201.11	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	7	0.13	1320.67	2548.8	125.88	1228.13	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	8	0.13	1278.79	2548.8	125.88	1270.01	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	9	0.12	1251.87	2548.8	125.88	1296.93	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice/good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre 541.979303	End day storage acre-feet 15594	total res. losses acre-feet 11904.72	evaporation losses acre-feet 4.0703	seepage losses acre-feet 1.1914
September	10	0.12	1213.20	2548.8	125.88	1335.60	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	11	0.12	1186.18	2548.8	125.88	1362.62	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	12	0.11	1155.37	2548.8	125.88	1393.43	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	13	0.11	1135.01	2548.8	125.88	1413.79	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	14	0.11	1102.65	2548.8	125.88	1446.15	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	15	0.11	1074.20	2548.8	125.88	1474.60	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	16	0.10	1042.72	2548.8	125.88	1506.08	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	17	0.10	1023.20	2548.8	125.88	1525.60	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	18	0.10	1011.90	2548.8	125.88	1536.90	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	19	0.10	985.72	2548.8	125.88	1563.08	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	20	0.09	957.86	2548.8	125.88	1590.94	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	21	0.09	948.76	2548.8	125.88	1600.04	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	22	0.09	948.81	2548.8	125.88	1599.99	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	23	0.09	954.74	2548.8	125.88	1594.06	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	24	0.09	961.87	2548.8	125.88	1586.93	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	25	0.09	944.43	2548.8	125.88	1604.37	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	26	0.09	909.57	2548.8	125.88	1639.23	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	27	0.09	877.28	2548.8	125.88	1671.52	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	28	0.08	856.54	2548.8	125.88	1692.26	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	29	0.08	820.85	2548.8	125.88	1727.95	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
September	30	0.08	824.09	2548.8	125.88	1724.71	297.52	0.00751	0.0021982	541.98	15594.00	131.14	4.0703	1.1914
October	1	0.08	805.92	2548.8	97.46	1742.88	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965

\*\*\*\*\*

NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choicegood choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor-Transpirat (inch) (1)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre	End day storage acre-feet	total res. losses acre-feet	evaporation losses acre-feet	seepage losses acre-feet
										541.979303	15594	11904.72		
October	2	0.08	783.23	2548.8	97.46	1765.57	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	3	0.07	751.22	2548.8	97.46	1797.58	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	4	0.07	716.34	2548.8	97.46	1832.46	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	5	0.07	688.85	2548.8	97.46	1859.95	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	6	0.07	671.17	2548.8	97.46	1877.63	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	7	0.06	653.20	2548.8	97.46	1895.60	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	8	0.06	636.49	2548.8	97.46	1912.31	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	9	0.06	641.66	2548.8	97.46	1907.14	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	10	0.06	602.36	2548.8	97.46	1946.44	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	11	0.06	591.73	2548.8	97.46	1957.07	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	12	0.06	569.54	2548.8	97.46	1979.26	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	13	0.05	557.67	2548.8	97.46	1991.13	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
October	14	0.05	535.63	2548.8	97.46	2013.17	297.52	0.00439032	0.001285	541.98	15594.00	100.53	2.3795	0.6965
		0.05			37764							39105.488	1037.74122	303.74686

- Notes:
1. Evap Trans = Peak EvaporTranspiration for an average 10 day period for year 2000. Data from Keller- Bleisner Engineering
  2. NIIP demand = Niip water demand based on downstream acreage, evaportranspiration, coveyance and irrigation efficiency (NIIP demand = ET\*downstream acreage/coveyance efficiency/irrigation efficiency)
  3. NIIP Canal availability = Design flowrate for system constraint between Mp45.7-Burnham, 1285 CFS

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NAVAJO GALLUP WATER SUPPLY PROJECT  
 MONCISCO RESERVOIR  
 capacity and NIIP operations year 2040

NIIP canal capacity 2548.8 acre feet  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Burnham South waste way gate, Max 250 CFS found by using "RADGAT"  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 82202 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 reservoir operational capacity = [redacted] acre feet good choice  
 100 year sediment = [redacted] acre feet found in ref. 2.  
 dead pool storage = [redacted] acre feet found in ref 2.  
 inactive storage = [redacted] acre feet found in ref. 2.  
 total reservoir size= 15594 acre feet  
 total diversion required NGWSP 39105 acre feet

Month	Day	Evapor- Transpirat (inch)	NIIP demand acre-feet	NIIP Canal availability acre-feet ref. (1)	NGWSP demand acre-feet ref (4)	NIIP surplus acre-feet	Inflow into Moncisco acre-feet	Evaporation loss (feet)	Seepage loss (feet)	Surface area reservoir acre	End day storage acre-feet	total res. losses acre-feet	evaporation losses acre-feet	seepage losses acre-feet
		(1)		ref. (1)	ref (4)					541.979303	15594	11904.72		

4. NGWSP demand = Daily demand based on existing NTUA demand pattern on Navajo Nation, ref. 4.
  5. NIIP surplus = Water available after NIIP demand is met. (NIIP surplus = NIIP Canal availability - NIIP demand).
  6. Inflow into Moncisco = Water flow into reservoir (Inflow into Moncisco = NIIP surplus to a maximum of 150 cfs)
  7. Evaporation loss = average evaporation loss for Navajo Reservoir.
  8. Seepage loss = seepage loss for Moncisco Reservoir from (ref. 2 page 10).
  9. Surface area = water surface area of reservoir. Equation based on area capacity curve. (surface area = .577\*reservoir volume^.709) with standard deviation of .999
  10. End of day storage = Storage of current day including inflow, outflow and losses.
  11. total losses = Reservoir losses (total losses = NGWSP demand + evaporation + seepage)
  12. NGWSP diversion = Required diversion for NGWSP which includes conveyance efficiency and losses in the reservoir
- There are no losses assumed for conveyance from Navajo Dam to Moncisco reservoir because NIIP's current operations reflect total losses and additional water would not increase existing losses.

Reference: 1. "Navajo Indian Irrigation Project, Gallegos Needs and Cost Assessment", May 1995, Keller-Bleisner Engineering  
 2. "Technical Memorandum No. GG-8311-2, "Gallegos Dam, Reconnaissance Design Summary", February 1995, Technical Service Center, Bureau of Reclamation  
 3. Navajo Nation Department of Water Resources.  
 4. Navajo Tribal Utility Authority memorandum.

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.4**

**Navajo Reservoir Evaporation Rates**

Navajo Reservoir Average Evaporation Rates  
2000

MONTH	EVAPORATION RATE(ft)
January	0.0477
February	0.0593
March	0.1228
April	0.1935
May	0.2768
June	0.3351
July	0.3584
August	0.2809
September	0.2253
October	0.1361
November	0.0666
December	0.0480

Yearly average evaporation rate is 2.17 feet.

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.5**

**Moncisco Reservoir Cost Estimate  
Year 2020 and 2040**

<b>FEATURE:</b>  <p style="text-align: center;"><b>Moncisco Reservoir</b>  <b>Crest elevation 6040</b>  <b>Year 2020</b></p>	<b>29-Jan-02</b>	<b>PROJECT:</b> NAVAJO GALLUP WATER SUPPLY PROJECT  <b>DIVISION:</b> NAVAJO GALLUP WATER SUPPLY PROJECT  <b>UNIT:</b>
<b>H:\NGWSP\moncisco\Moncis-elev6040.WK4</b>		

PLANT ACCT.	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Excavation for dam foundation	223	859,300	CY	\$4.00	\$3,437,200.00
		Earthfill in Dam - Zone 1	223	295,100	CY	\$7.00	\$2,065,700.00
		Earthfill in Dam - Zone 2	223	212,500	CY	\$24.00	\$5,100,000.00
		Earthfill in Dam - Zone 2a	223	155,100	CY	\$27.00	\$4,187,700.00
		Earthfill in Dam - Zone 3	223	2,033,200	CY	\$6.00	\$12,199,200.00
		Soil Cement slope protection U/S	223	84,700	CY	\$35.00	\$2,964,500.00
		Soil Cement slope protection D/S	223	28,100	CY	\$35.00	\$983,500.00
		Spillway 100' crest length	223	1	LS		\$7,862,000.00
		Outlet Works	223	1	LS		\$850,000.00
		Natural Channel Stabilization	223	1	LS		\$2,054,000.00
		Mitigation and Relocation of Utilities	223	1	LS		\$3,456,000.00
		Mobilization and Preparatory 5%		1	LS		\$2,258,000.00
						Subtotal	\$47,417,800.00
		Unlisted items 10%					
						Subtotal	\$52,159,580.00
		Contingencies 20%					
						Total	\$61,643,140.00

QUANTITIES		PRICES	
BY Leon Baros	APPROVED	BY	CHECKED
DATE PREPARED 29-Jan-02	DATE	DATE	PRICE LEVEL

**ESTIMATE WORKSHEET**

<b>FEATURE:</b>  <b>Moncisco Reservoir</b> <b>Crest elevation 6047</b> <b>Year 2040</b>	<b>28-Jan-02</b>	<b>PROJECT:</b> NAVAJO GALLUP WATER SUPPLY PROJECT  <b>DIVISION:</b> NAVAJO GALLUP WATER SUPPLY PROJECT  <b>UNIT:</b>
<b>H:\NGWSP\moncisco\Moncis-elev6047.WK4</b>		

PLANT ACCT.	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Excavation for dam foundation	223	982,900	CY	\$4.00	\$3,931,600.00
		Earthfill in Dam - Zone 1	223	336,400	CY	\$7.00	\$2,354,800.00
		Earthfill in Dam - Zone 2	223	243,900	CY	\$24.00	\$5,853,600.00
		Earthfill in Dam - Zone 2a	223	176,000	CY	\$27.00	\$4,752,000.00
		Earthfill in Dam - Zone 3	223	2,497,800	CY	\$6.00	\$14,986,800.00
		Soil Cement slope protection U/S	223	101,200	CY	\$35.00	\$3,542,000.00
		Soil Cement slope protection D/S	223	33,300	CY	\$35.00	\$1,165,500.00
		Spillway 100' crest length	223	1	LS		\$7,862,000.00
		Outlet Works	223	1	LS		\$850,000.00
		Natural Channel Stabilization	223	1	LS		\$2,054,000.00
		Mitigaiton and Relocation of Utilities	223	1	LS		\$3,456,000.00
		Mobilization and Preparatory 5%		1	LS		\$2,540,500.00
						Subtotal	\$53,348,800.00
		Unlisted items 10%				Subtotal	\$58,683,680.00
		Contingencies 20%				Total	\$69,353,440.00

<b>QUANTITIES</b>		<b>PRICES</b>	
BY Leon Baros	APPROVED	BY	CHECKED
DATE PREPARED 28-Jan-02	DATE	DATE	PRICE LEVEL

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.6**

**NIIP Conveyance Efficiency**

NIIP Canal Efficiency  
1996-2000

Year	Month	Navajo Release acre feet	Cutter Release acre feet	Water Usage acre feet	Canal Efficiency Cutter	total diversion acre feet per year	Canal Efficiency Navajo
2000	March	2100				137700	0.90
2000	April						
2000	May	23400	22963	21985	0.96		
2000	June	34700	34808	31900	0.92		
2000	July	31000	32352	28543	0.88		
2000	August	26900	26683	24685	0.93		
2000	September	17400	17318	16517	0.95		
2000	October	2200					
1999	March	2600				113700	0.94
1999	April	6800	8601	6683	0.78		
1999	May	12800	17157	14679	0.86		
1999	June	32300	36482	30973	0.85		
1999	July	28800	31356	28677	0.91		
1999	August	15900	16573	14863	0.90		
1999	September	10600	13224	11123	0.84		
1999	October	3900					
1998	March	2900				139200	0.89
1998	April	9700	12873	9879	0.77		
1998	May	no data					
1998	June	39700	43007	34293	0.80		
1998	July	35200	40093	29922	0.75		
1998	August	32000	34149	31324	0.92		
1998	September	17700	19810	17969	0.91		
1998	October	2000					
1997	March	2600				156800	0.92
1997	April	8200	8494	7894	0.93		
1997	May	24000	23121	20758	0.90		
1997	June	35800	38074	34491	0.91		
1997	July	41900	47227	39812	0.84		
1997	August	28700	31738	27831	0.88		
1997	September	14500	17731	12866	0.73		
1997	October	1100					
1996	March	2300	2990			180100	0.88
1996	April	no data					
1996	May	30000	30856	26486	0.86		
1996	June	39500	43819	37924	0.87		
1996	July	40500	47789	37321	0.78		
1996	August	38600	45140	34226	0.76		
1996	September	22300	24865	22426	0.90		
1996	October	6900	10959				

total average efficiency from Cutter= 0.86

total average efficiency from Navajo = 0.91

Measurements of water usage are at the pumping plants

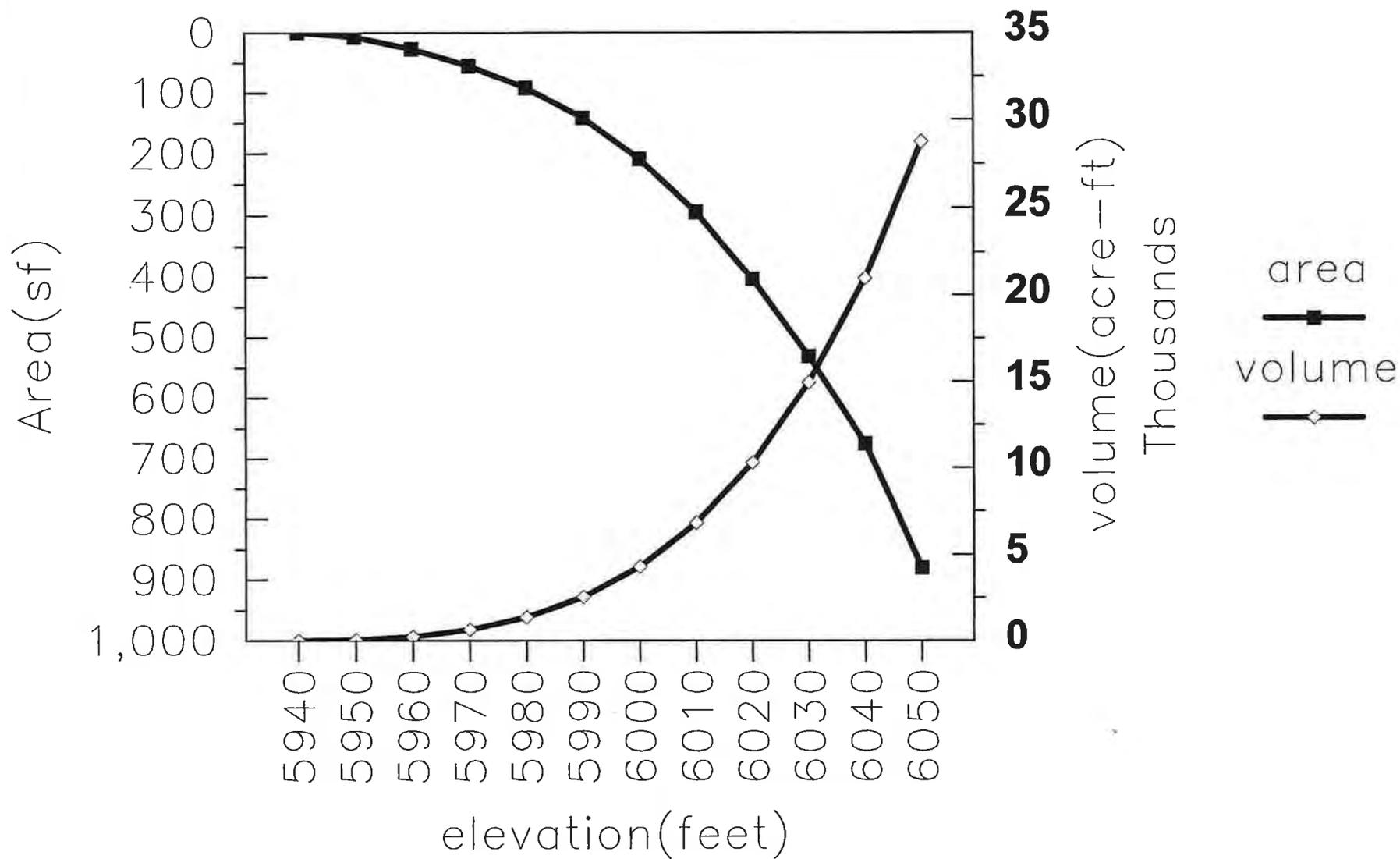
Data Provided by NAPI

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.7**

**Moncisco Reservoir Area Capacity Curve**

# Area Capacity Curve



NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.8**

**NIIP Moncisco Alternative  
O&M Costs  
Year 2020 and 2040**

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Moncisco Alternative Year 2020  
 October 17, 2001

Estimated Present Cost Index=  
 based on 1977 = 1.00 3.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$3,320.45
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	\$8,866.97
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	\$3,290.69
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	\$3,106.65
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	\$1,808.30
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	\$584.18
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$673.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	\$3,422.93
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
					Grand Total	\$24,400

NOTES:

Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 43cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT

GALLEGOS PUMPING PLANT YEAR 2020

O&M COSTS FOR GALLEGOS NIIP IRRIGATION SEASON  
October 23, 2001

46749 ACRES @ 2.96 ACRE-FEET/ACRE FOR NIIP

UNATTENDED PLANT

CAPACITY	880. CFS	DESIGN HEAD	337. FT
HORSEPOWER	43714.	PUMP EFFICIENCY	.77
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	138377. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	62015900.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	32622.

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COST OF OPERATION

LABOR COST \$ 11250.  
OTHER COST \$ 3599.  
TOTAL \$ 14849.

**ANNUAL O. & M. COST \$ 97188.**

COST OF MAINTENANCE

LABOR COST \$ 46908.  
OTHER COST \$ 35431.  
TOTAL \$ 82339.

ENERGY

KWH COST \$ 502329.

DEMAND COST \$897747.

**ANNUAL ENERGY COST \$ 1400075.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 6300000.	\$ 41386.
STRUCTURES AND IMPROVEMENTS	\$11800000.	\$ 937.
MISCELLANEOUS EQUIPMENT	\$ 1400000.	\$ 1713.
ACCESSORY ELECTRIC EQUIPMENT	\$ 5600000.	\$ 110769.

**ANNUAL REPLACEMENT COST \$ 154805.**

**TOTAL ANNUAL COST \$ 1652068.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT

GALLEGOS PUMPING PLANT YEAR 2020

O&M COSTS FOR GALLEGOS NIIP AND NGWSP IRRIGATION SEASON  
October 23, 2001

46749 ACRES @ 2.96 ACRE-FEET/ACRE FOR NIIP AND 23,928 FOR NGWSP

UNATTENDED PLANT

CAPACITY	880. CFS	DESIGN HEAD	337. FT
HORSEPOWER	43714.	PUMP EFFICIENCY	.77
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	162305. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	72739620.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	32622.

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COST OF OPERATION

LABOR COST \$ 11250.  
OTHER COST \$ 3599.  
TOTAL \$ 14849.

COST OF MAINTENANCE

LABOR COST \$ 50238.  
OTHER COST \$ 37946.  
TOTAL \$ 88184.

**ANNUAL O. & M. COST \$ 103033.**

ENERGY

KWH COST \$ 589191.

DEMAND COST \$897747.

**ANNUAL ENERGY COST \$ 1486938.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 6300000.	\$ 41386.
STRUCTURES AND IMPROVEMENTS	\$11800000.	\$ 937.
MISCELLANEOUS EQUIPMENT	\$ 1400000.	\$ 1713.
ACCESSORY ELECTRIC EQUIPMENT	\$ 5600000.	\$ 110769.

**ANNUAL REPLACEMENT COST \$ 154805.**

**TOTAL ANNUAL COST \$ 1744776.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Moncisco Alternative Year 2040  
 October 17, 2001

Estimated Present Cost Index= 3.00  
 based on 1977 = 1.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$5,173.73
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	\$13,815.98
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	\$5,127.35
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	\$4,840.59
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	\$2,817.58
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	\$910.23
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,265.39	
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	\$5,333.41
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
					Grand Total	\$38,019

NOTES:

Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 67cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT

GALLEGOS PUMPING PLANT YEAR 2040

O&M COSTS FOR GALLEGOS NIIP IRRIGATION SEASON

October 23, 2001

46749 ACRES @ 2.96 ACRE-FEET/ACRE FOR NIIP

UNATTENDED PLANT

CAPACITY	880. CFS	DESIGN HEAD	337. FT
HORSEPOWER	43714.	PUMP EFFICIENCY	.77
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	138377. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	62015900.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	32622.

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COST OF OPERATION

LABOR COST \$ 11250.  
OTHER COST \$ 3599.  
TOTAL \$ 14849.

**ANNUAL O. & M. COST \$ 97188.**

COST OF MAINTENANCE

LABOR COST \$ 46908.  
OTHER COST \$ 35431.  
TOTAL \$ 82339.

ENERGY

KWH COST \$ 502329.

DEMAND COST \$897747.

**ANNUAL ENERGY COST \$ 1400075.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 6300000.	\$ 41386.
STRUCTURES AND IMPROVEMENTS	\$11800000.	\$ 937.
MISCELLANEOUS EQUIPMENT	\$ 1400000.	\$ 1713.
ACCESSORY ELECTRIC EQUIPMENT	\$ 5600000.	\$ 110769.

**ANNUAL REPLACEMENT COST \$ 154805.**

**TOTAL ANNUAL COST \$ 1652068.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT

GALLEGOS PUMPING PLANT YEAR 2040

O&M COSTS FOR GALLEGOS NIIP AND NGWSP IRRIGATION SEASON  
October 23, 2001

46749 ACRES @ 2.96 ACRE-FEET/ACRE FOR NIIP AND 37,764 FOR NGWSP

UNATTENDED PLANT

CAPACITY	880. CFS	DESIGN HEAD	337. FT
HORSEPOWER	43714.	PUMP EFFICIENCY	.77
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	176141. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	78940460.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	32622.

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COST OF OPERATION

LABOR COST \$ 11250.  
OTHER COST \$ 3599.  
TOTAL \$ 14849.

COST OF MAINTENANCE

LABOR COST \$ 52037.  
OTHER COST \$ 39304.  
TOTAL \$ 91341.

**ANNUAL O. & M. COST \$ 106190.**

ENERGY

KWH COST \$ 639418.

DEMAND COST \$897747.

**ANNUAL ENERGY COST \$ 1537164.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 6300000.	\$ 41386.
STRUCTURES AND IMPROVEMENTS	\$11800000.	\$ 937.
MISCELLANEOUS EQUIPMENT	\$ 1400000.	\$ 1713.
ACCESSORY ELECTRIC EQUIPMENT	\$ 5600000.	\$ 110769.

**ANNUAL REPLACEMENT COST \$ 154805.**

**TOTAL ANNUAL COST \$ 1798159.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix B.9**

**Burnham Lateral Wasteway Capacity**

Navajo Gallup Water Supply Project  
 Burnham Lateral Wasteway  
 Orifice Plate equation(submerged)

Water Depth (Ft)	Vertical Gate Opening (cfs)							
	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00
0.5	5.21							
1	9.03	14.75						
1.5	11.66	20.86	27.09					
2	13.80	25.54	34.98	41.71				
2.5	15.64	29.50	41.39	51.09	58.30			
3	17.29	32.98	46.93	58.99	68.98	76.63		
3.5	18.80	36.12	51.88	65.95	78.21	88.49	96.57	
4	20.19	39.02	56.40	72.25	86.47	98.93	109.50	117.98
4.5	21.50	41.71	60.58	78.04	94.00	108.37	121.05	131.91
5	22.73	44.24	64.50	83.43	100.97	117.06	131.60	144.50
5.5	23.89	46.64	68.18	88.49	107.49	125.14	141.36	156.08
6	25.01	48.91	71.68	93.27	113.64	132.73	150.49	166.85
6.5	26.07	51.09	75.02	97.83	119.47	139.91	159.09	176.97
7	27.09	53.17	78.21	102.18	125.03	146.74	167.26	186.55
7.5	28.08	55.18	81.28	106.35	130.35	153.26	175.04	195.65
8	29.03	57.12	84.24	110.36	135.47	159.52	182.49	204.35
8.5	29.95	58.99	87.09	114.24	140.39	165.54	189.65	212.70
9	30.85	60.81	89.86	117.98	145.15	171.35	196.55	220.72
9.5	31.72	62.57	92.54	121.61	149.76	176.97	203.22	228.47
10	32.56	64.28	95.15	125.14	154.24	182.42	209.67	235.96
10.5	33.39	65.95	97.69	128.57	158.58	187.71	215.93	243.23
11	34.19	67.58	100.16	131.91	162.81	192.85	222.01	250.28

Burnham Lateral Wasteway is 6x4 slide gate

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix C**

**NIIP Cutter Alternative**

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix C.1**

**NIIP Cutter Alternative  
O&M Costs  
Year 2020 and 2040**

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Cutter Alternative  
 November 15, 2001  
 Year 2020

Estimated Present Cost Index= 3.00  
 based on 1977 = 1.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$3,320.45
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.08	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
						Grand Total \$3,320

NOTES:  
 Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 43cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Cutter Alternative  
 November 15, 2001  
 Year 2040

Estimated Present Cost Index= 3.00  
 based on 1977 = 1.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobemador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$5,173.73
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4080 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
						Grand Total \$5,174

NOTES:

Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 67cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix C.2**

**NIIP Cutter Alternative  
Winterization Costs**



NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix D**

**NIIP Coury Alternative**

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix D.1**

**NIIP Coury Alternative  
Operational Model**

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
								20	
October	15	0.06	72.76	396.69	61.75	323.93	262.1797	0.0044	1360.00
October	16	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	17	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	18	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	19	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	20	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	21	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	22	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	23	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	24	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	25	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	26	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	27	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	28	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	29	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	30	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
October	31	0	0.00	396.69	61.75	396.69	334.9429	0.0044	1360.00
November	1	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	2	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	3	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	4	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	5	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	6	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
November	7	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	8	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	9	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	10	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	11	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	12	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	13	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	14	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	15	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	16	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	17	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	18	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	19	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	20	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	21	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	22	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	23	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	24	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	25	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	26	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	27	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	28	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	29	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00
November	30	0	0.00	396.69	55.83	396.69	340.8606	0.0022	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	1	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	2	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	3	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	4	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	5	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	6	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	7	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	8	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	9	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	10	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	11	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	12	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	13	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	14	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	15	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	16	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	17	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	18	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	19	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	20	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	21	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	22	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	23	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	24	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	25	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	26	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	27	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	28	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	29	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	30	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
December	31	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	1	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	2	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	3	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	4	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	5	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	6	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	7	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	8	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	9	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	10	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	11	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	12	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	13	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	14	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	15	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	16	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	17	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
January	18	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	19	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	20	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	21	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	22	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	23	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	24	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	25	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	26	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	27	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	28	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	29	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	30	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
January	31	0	0.00	396.69	54.03	396.69	342.6616	0.0015	1360.00
February	1	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	2	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	3	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	4	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	5	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	6	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	7	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	8	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	9	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	10	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
February	11	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	12	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	13	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	14	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	15	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	16	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	17	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	18	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	19	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	20	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	21	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	22	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	23	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	24	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	25	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	26	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	27	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
February	28	0	0.00	396.69	51.27	396.69	345.4183	0.0021	1360.00
March	1	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00
March	2	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00
March	3	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00
March	4	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00
March	5	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00
March	6	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	7	0.01	11.93	396.69	69.47	384.76	315.2958	0.0040	1360.00
March	8	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	9	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	10	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	11	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	12	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	13	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	14	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	15	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	16	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	17	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	18	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	19	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	20	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	21	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	22	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	23	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	24	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	25	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	26	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	27	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	28	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	29	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
March	30	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	31	0.00	0.00	396.69	69.47	396.69	327.2242	0.0040	1360.00
April	1	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	2	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	3	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	4	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	5	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	6	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	7	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	8	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	9	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	10	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	11	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	12	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	13	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	14	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	15	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	16	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	17	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	18	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	19	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	20	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	21	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	22	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	23	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
April	24	0.00	0.00	396.69	55.83	396.69	340.8606	0.0065	1360.00
April	25	0.01	13.41	396.69	55.83	383.28	327.4486	0.0065	1360.00
April	26	0.02	19.00	396.69	55.83	377.70	321.8646	0.0065	1360.00
April	27	0.02	29.75	396.69	55.83	366.95	311.1142	0.0065	1360.00
April	28	0.02	28.96	396.69	55.83	367.73	311.8970	0.0065	1360.00
April	29	0.04	44.36	396.69	55.83	352.33	296.5019	0.0065	1360.00
April	30	0.05	61.84	396.69	55.83	334.85	279.0193	0.0065	1360.00
May	1	0.05	65.49	396.69	69.47	331.20	261.7299	0.0089	1360.00
May	2	0.08	93.94	396.69	69.47	302.76	233.2881	0.0089	1360.00
May	3	0.09	108.13	396.69	69.47	288.56	219.0933	0.0089	1360.00
May	4	0.09	108.55	396.69	69.47	288.14	218.6758	0.0089	1360.00
May	5	0.10	120.24	396.69	69.47	276.45	206.9860	0.0089	1360.00
May	6	0.11	127.34	396.69	69.47	269.36	199.8886	0.0089	1360.00
May	7	0.07	85.59	396.69	69.47	311.11	241.6380	0.0089	1360.00
May	8	0.07	79.74	396.69	69.47	316.95	247.4829	0.0089	1360.00
May	9	0.09	110.22	396.69	69.47	286.47	217.0058	0.0089	1360.00
May	10	0.09	111.47	396.69	69.47	285.22	215.7534	0.0089	1360.00
May	11	0.10	113.98	396.69	69.47	282.72	213.2484	0.0089	1360.00
May	12	0.12	142.37	396.69	69.47	254.33	184.8588	0.0089	1360.00
May	13	0.09	106.46	396.69	69.47	290.23	220.7633	0.0089	1360.00
May	14	0.12	148.21	396.69	69.47	248.48	179.0139	0.0089	1360.00
May	15	0.09	102.70	396.69	69.47	293.99	224.5207	0.0089	1360.00
May	16	0.09	104.96	396.69	69.47	291.73	222.2618	0.0089	1360.00
May	17	0.14	163.88	396.69	69.47	232.81	163.3430	0.0089	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
May	18	0.13	158.35	396.69	69.47	238.34	168.8748	0.0089	1360.00
May	19	0.08	95.45	396.69	69.47	301.24	231.7747	0.0089	1360.00
May	20	0.09	110.51	396.69	69.47	286.18	216.7151	0.0089	1360.00
May	21	0.08	96.87	396.69	69.47	299.83	230.3582	0.0089	1360.00
May	22	0.09	111.87	396.69	69.47	284.82	215.3508	0.0089	1360.00
May	23	0.14	162.38	396.69	69.47	234.32	164.8489	0.0089	1360.00
May	24	0.10	115.08	396.69	69.47	281.61	212.1450	0.0089	1360.00
May	25	0.08	96.55	396.69	69.47	300.15	230.6788	0.0089	1360.00
May	26	0.09	106.98	396.69	69.47	289.71	220.2414	0.0089	1360.00
May	27	0.11	134.61	396.69	69.47	262.08	192.6123	0.0089	1360.00
May	28	0.13	153.92	396.69	69.47	242.77	173.3032	0.0089	1360.00
May	29	0.14	169.92	396.69	69.47	226.77	157.3042	0.0089	1360.00
May	30	0.17	198.68	396.69	69.47	198.01	128.5419	0.0089	1360.00
May	31	0.17	200.40	396.69	69.47	196.30	126.8272	0.0089	1360.00
June	1	0.15	173.11	396.69	79.76	223.58	143.8218	0.0112	1360.00
June	2	0.14	171.19	396.69	79.76	225.51	145.7452	0.0112	1360.00
June	3	0.16	191.90	396.69	79.76	204.79	125.0345	0.0112	1360.00
June	4	0.17	197.27	396.69	79.76	199.43	119.6668	0.0112	1360.00
June	5	0.20	238.20	396.69	79.76	158.50	78.7375	0.0112	1360.00
June	6	0.22	267.40	396.69	79.76	129.29	49.5278	0.0112	1360.00
June	7	0.20	232.60	396.69	79.76	164.09	84.3289	0.0112	1360.00
June	8	0.18	212.92	396.69	79.76	183.77	104.0107	0.0112	1360.00
June	9	0.21	249.42	396.69	79.76	147.27	67.5099	0.0112	1360.00
June	10	0.19	229.17	396.69	79.76	167.52	87.7583	0.0112	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
June	11	0.20	243.40	396.69	79.76	153.29	73.5337	0.0112	1360.00
June	12	0.25	301.88	396.69	79.76	94.81	15.0547	0.0112	1360.00
June	13	0.23	277.07	396.69	79.76	119.63	39.8658	0.0112	1360.00
June	14	0.23	269.82	396.69	79.76	126.87	47.1123	0.0112	1360.00
June	15	0.20	234.01	396.69	79.76	162.69	82.9273	0.0112	1360.00
June	16	0.24	280.63	396.69	79.76	116.06	36.3022	0.0112	1360.00
June	17	0.20	236.48	396.69	79.76	160.21	80.4522	0.0112	1360.00
June	18	0.22	263.77	396.69	79.76	132.93	53.1660	0.0112	1360.00
June	19	0.23	279.23	396.69	79.76	117.46	37.7038	0.0112	1360.00
June	20	0.31	366.35	396.69	79.76	30.34	-49.4182	0.0112	1309.82
June	21	0.28	338.53	396.69	79.76	58.16	-21.5953	0.0112	1287.47
June	22	0.33	394.61	396.69	79.76	2.09	-77.6736	0.0112	1209.03
June	23	0.26	313.69	396.69	79.76	83.01	3.2456	0.0112	1211.52
June	24	0.28	333.34	396.69	79.76	63.35	-16.4064	0.0112	1194.35
June	25	0.23	279.84	396.69	79.76	116.85	37.0925	0.0112	1230.69
June	26	0.25	294.24	396.69	79.76	102.45	22.6889	0.0112	1252.62
June	27	0.30	355.08	396.69	79.76	41.61	-38.1459	0.0112	1213.71
June	28	0.30	352.26	396.69	79.76	44.43	-35.3278	0.0112	1177.62
June	29	0.26	312.54	396.69	79.76	84.15	4.3937	0.0112	1181.26
June	30	0.26	315.96	396.69	79.76	80.73	0.9718	0.0112	1181.47
July	1	0.30	357.99	396.69	77.19	38.71	-38.4805	0.0116	1142.20
July	2	0.30	361.54	396.69	77.19	35.15	-42.0367	0.0116	1099.38
July	3	0.26	310.57	396.69	77.19	86.12	8.9348	0.0116	1107.53
July	4	0.25	294.33	396.69	77.19	102.36	25.1724	0.0116	1131.92

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

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 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	5	0.31	369.48	396.69	77.19	27.21	-49.9765	0.0116	1081.15
July	6	0.31	373.24	396.69	77.19	23.45	-53.7340	0.0116	1026.63
July	7	0.25	299.34	396.69	77.19	97.35	20.1624	0.0116	1046.01
July	8	0.32	375.74	396.69	77.19	20.95	-56.2389	0.0116	988.98
July	9	0.27	316.88	396.69	77.19	79.81	2.6277	0.0116	990.83
July	10	0.33	390.77	396.69	77.19	5.92	-71.2687	0.0116	918.77
July	11	0.33	392.03	396.69	77.19	4.67	-72.5212	0.0116	845.46
July	12	0.30	359.46	396.69	77.19	37.23	-39.9567	0.0116	804.72
July	13	0.30	356.96	396.69	77.19	39.74	-37.4517	0.0116	766.48
July	14	0.34	410.81	396.69	77.19	(14.12)	-91.3084	0.0116	674.39
July	15	0.26	314.37	396.69	77.19	82.32	5.1327	0.0116	678.73
July	16	0.24	289.32	396.69	77.19	107.37	30.1823	0.0116	708.13
July	17	0.25	295.59	396.69	77.19	101.11	23.9199	0.0116	731.26
July	18	0.26	305.61	396.69	77.19	91.09	13.9000	0.0116	744.38
July	19	0.29	348.19	396.69	77.19	48.50	-28.6843	0.0116	714.91
July	20	0.31	370.73	396.69	77.19	25.96	-51.2290	0.0116	662.89
July	21	0.28	338.17	396.69	77.19	58.52	-18.6645	0.0116	643.44
July	22	0.25	303.10	396.69	77.19	93.59	16.4050	0.0116	659.06
July	23	0.30	354.45	396.69	77.19	42.24	-34.9468	0.0116	623.33
July	24	0.27	326.90	396.69	77.19	69.79	-7.3922	0.0116	615.15
July	25	0.31	365.72	396.69	77.19	30.97	-46.2191	0.0116	568.14
July	26	0.31	371.99	396.69	77.19	24.71	-52.4815	0.0116	514.88
July	27	0.36	425.84	396.69	77.19	(29.15)	-106.3382	0.0116	407.75
July	28	0.33	393.28	396.69	77.19	3.41	-73.7737	0.0116	333.19

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

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 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	29	0.30	356.96	396.69	77.19	39.74	-37.4517	0.0116	294.95
July	30	0.30	359.46	396.69	77.19	37.23	-39.9567	0.0116	254.21
July	31	0.29	341.93	396.69	77.19	54.77	-22.4219	0.0116	231.00
August	1	0.31	365.72	396.69	77.19	30.97	-46.2191	0.0091	184.17
August	2	0.29	349.44	396.69	77.19	47.25	-29.9368	0.0091	153.61
August	3	0.29	345.68	396.69	77.19	51.01	-26.1794	0.0091	126.82
August	4	0.30	353.20	396.69	77.19	43.49	-33.6943	0.0091	92.51
August	5	0.30	351.95	396.69	77.19	44.75	-32.4418	0.0091	59.45
August	6	0.22	265.53	396.69	77.19	131.17	53.9794	0.0091	112.81
August	7	0.26	310.62	396.69	77.19	86.08	8.8901	0.0091	121.09
August	8	0.29	345.28	396.69	77.19	51.41	-25.7768	0.0091	94.70
August	9	0.26	315.45	396.69	77.19	81.25	4.0591	0.0091	98.14
August	10	0.28	334.55	396.69	77.19	62.15	-15.0412	0.0091	82.48
August	11	0.26	310.39	396.69	77.19	86.30	9.1138	0.0091	90.98
August	12	0.30	358.09	396.69	77.19	38.60	-38.5849	0.0091	51.78
August	13	0.30	352.20	396.69	77.19	44.49	-32.6953	0.0091	18.47
August	14	0.28	331.00	396.69	77.19	65.69	-11.4925	0.0091	6.36
August	15	0.23	269.51	396.69	77.19	127.19	49.9983	0.0091	55.74
August	16	0.28	331.01	396.69	77.19	65.68	-11.5075	0.0091	43.62
August	17	0.25	293.89	396.69	77.19	102.81	25.6197	0.0091	68.62
August	18	0.23	277.56	396.69	77.19	119.13	41.9467	0.0091	109.95
August	19	0.24	282.66	396.69	77.19	114.03	36.8473	0.0091	146.18
August	20	0.23	273.13	396.69	77.19	123.56	46.3751	0.0091	191.94
August	21	0.23	268.90	396.69	77.19	127.80	50.6097	0.0091	241.93

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
August	22	0.21	253.75	396.69	77.19	142.95	65.7587	0.0091	307.08
August	23	0.19	231.26	396.69	77.19	165.43	88.2437	0.0091	394.70
August	24	0.19	230.67	396.69	77.19	166.03	88.8402	0.0091	482.93
August	25	0.15	180.27	396.69	77.19	216.42	139.2376	0.0091	621.55
August	26	0.16	190.69	396.69	77.19	206.00	128.8152	0.0091	749.75
August	27	0.18	212.30	396.69	77.19	184.40	107.2099	0.0091	856.34
August	28	0.18	210.42	396.69	77.19	186.28	109.0886	0.0091	964.81
August	29	0.16	192.66	396.69	77.19	204.03	126.8470	0.0091	1091.04
August	30	0.17	197.18	396.69	77.19	199.52	122.3291	0.0091	1212.76
August	31	0.18	214.17	396.69	77.19	182.52	105.3312	0.0091	1317.47
September	1	0.14	162.33	396.69	79.76	234.36	154.6021	0.0075	1360.00
September	2	0.15	175.50	396.69	79.76	221.20	141.4361	0.0075	1360.00
September	3	0.14	171.40	396.69	79.76	225.30	145.5365	0.0075	1360.00
September	4	0.13	156.63	396.69	79.76	240.06	160.2979	0.0075	1360.00
September	5	0.12	143.44	396.69	79.76	253.25	173.4936	0.0075	1360.00
September	6	0.12	148.87	396.69	79.76	247.83	168.0662	0.0075	1360.00
September	7	0.13	149.64	396.69	79.76	247.05	167.2909	0.0075	1360.00
September	8	0.11	134.13	396.69	79.76	262.56	182.7978	0.0075	1360.00
September	9	0.13	155.07	396.69	79.76	241.62	161.8635	0.0075	1360.00
September	10	0.13	154.29	396.69	79.76	242.40	162.6388	0.0075	1360.00
September	11	0.15	173.68	396.69	79.76	223.02	143.2552	0.0075	1360.00
September	12	0.13	155.84	396.69	79.76	240.85	161.0881	0.0075	1360.00
September	13	0.11	127.16	396.69	79.76	269.54	189.7759	0.0075	1360.00
September	14	0.12	148.09	396.69	79.76	248.60	168.8416	0.0075	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
September	15	0.10	123.28	396.69	79.76	273.41	193.6526	0.0075	1360.00
September	16	0.12	147.32	396.69	79.76	249.38	169.6169	0.0075	1360.00
September	17	0.13	159.72	396.69	79.76	236.97	157.2114	0.0075	1360.00
September	18	0.14	164.37	396.69	79.76	232.32	152.5593	0.0075	1360.00
September	19	0.14	162.05	396.69	79.76	234.65	154.8854	0.0075	1360.00
September	20	0.14	161.27	396.69	79.76	235.42	155.6607	0.0075	1360.00
September	21	0.14	172.90	396.69	79.76	223.79	144.0305	0.0075	1360.00
September	22	0.14	161.27	396.69	79.76	235.42	155.6607	0.0075	1360.00
September	23	0.13	155.84	396.69	79.76	240.85	161.0881	0.0075	1360.00
September	24	0.14	165.92	396.69	79.76	230.77	151.0086	0.0075	1360.00
September	25	0.09	110.10	396.69	79.76	286.59	206.8335	0.0075	1360.00
September	26	0.12	144.99	396.69	79.76	251.70	171.9430	0.0075	1360.00
September	27	0.16	186.08	396.69	79.76	210.61	130.8496	0.0075	1360.00
September	28	0.14	169.80	396.69	79.76	226.89	147.1319	0.0075	1360.00
September	29	0.17	203.92	396.69	79.76	192.78	113.0167	0.0075	1360.00
September	30	0.13	156.62	396.69	79.76	240.07	160.3128	0.0075	1360.00
October	1	0.10	113.98	396.69	61.75	282.72	220.9671	0.0044	1360.00
October	2	0.10	121.73	396.69	61.75	274.96	213.2137	0.0044	1360.00
October	3	0.11	129.48	396.69	61.75	267.21	205.4602	0.0044	1360.00
October	4	0.10	120.95	396.69	61.75	275.74	213.9890	0.0044	1360.00
October	5	0.12	139.56	396.69	61.75	257.13	195.3807	0.0044	1360.00
October	6	0.12	138.79	396.69	61.75	257.91	196.1560	0.0044	1360.00
October	7	0.13	153.52	396.69	61.75	243.17	181.4245	0.0044	1360.00
October	8	0.13	160.50	396.69	61.75	236.20	174.4464	0.0044	1360.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
October	9	0.13	154.29	396.69	61.75	242.40	180.6491	0.0044	1360.00
October	10	0.12	138.79	396.69	61.75	257.91	196.1560	0.0044	1360.00
October	11	0.06	73.66	396.69	61.75	323.03	261.2851	0.0044	1360.00
October	12	0.09	111.65	396.69	61.75	285.04	223.2931	0.0044	1360.00
October	13	0.10	118.63	396.69	61.75	278.06	216.3150	0.0044	1360.00
October	14	0.11	128.71	396.69	61.75	267.99	206.2355	0.0044	1360.00
		0.05			23928				
		0.05							

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2020

Amarillo Canal Capacity 396.6926 acre feet per day  
 NGWSP diversion = 23928 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
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- Notes:
1. Evap Trans = Peak EvaporTranspiration for an average 10 day period for year 2000. Data from Keller- Bleisner Engineering
  2. NIIP demand = Niip water demand based on downstream acreage, evaportranspiration, conveyance and irrigation efficiency (NIIP demand = ET\*downstream acreage/conveyance efficiency/irrigation efficiency)
  3. NIIP Canal availability = Design flowrate for system at the point of diversion
  4. NGWSP demand = Daily demand based on bell shaped distribution of the yearly demand ref. 4.
  5. NIIP surplus = Water available after NIIP demand is met. (NIIP surplus = NIIP Canal availability - NIIP demand).
  6. Available for storage = Excess water available aftering meeting NIIP and NGWSP needs
  7. Evaporation loss = average evaporation loss based on Navajo Reservoir evaporation.
  8. Cummulative storage = Storage of current day including inflow, outflow and losses.
- There are no losses assumed for conveyance from Navajo Dam through NIIP system assessed to NGWSP because NIIP's current operations reflect total losses and additional water would not increase existing losses(i.e. NIIP operates at full canal level).

- Reference:
1. "Navajo Indian Irrigation Project, Gallegos Needs and Cost Assessment", May 1995, Keller-Bleisner Engineering
  2. "Technical Memorandum No. GG-8311-2, "Gallegos Dam, Reconnaissance Design Summary", February 1995, Technical Service Center, Bureau of Reclamation
  3. Navajo Nation Department of Water Resources.
  4. Navajo Tribal Utility Authority memorandum.



Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
								20	
October	15	0.06	72.76	396.69	97.46	323.93	226.47	0.0044	4060.00
October	16	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	17	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	18	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	19	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	20	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	21	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	22	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	23	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	24	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	25	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	26	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	27	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	28	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	29	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	30	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
October	31	0	0.00	396.69	97.46	396.69	299.24	0.0044	4060.00
November	1	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	2	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	3	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	4	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	5	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	6	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
November	7	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	8	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	9	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	10	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	11	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	12	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	13	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	14	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	15	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	16	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	17	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	18	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	19	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	20	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	21	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	22	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	23	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	24	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	25	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	26	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	27	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	28	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	29	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00
November	30	0	0.00	396.69	88.12	396.69	308.58	0.0022	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	1	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	2	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	3	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	4	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	5	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	6	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	7	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	8	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	9	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	10	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	11	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	12	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	13	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	14	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	15	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	16	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	17	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	18	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	19	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	20	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	21	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	22	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	23	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	24	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	25	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	26	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	27	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	28	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	29	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	30	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
December	31	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	1	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	2	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	3	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	4	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	5	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	6	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	7	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	8	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	9	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	10	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	11	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	12	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	13	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	14	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	15	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	16	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	17	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
January	18	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	19	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	20	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	21	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	22	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	23	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	24	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	25	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	26	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	27	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	28	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	29	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	30	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
January	31	0	0.00	396.69	85.27	396.69	311.42	0.0015	4060.00
February	1	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	2	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	3	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	4	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	5	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	6	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	7	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	8	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	9	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	10	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
February	11	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	12	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	13	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	14	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	15	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	16	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	17	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	18	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	19	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	20	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	21	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	22	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	23	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	24	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	25	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	26	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	27	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
February	28	0	0.00	396.69	80.92	396.69	315.77	0.0021	4060.00
March	1	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00
March	2	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00
March	3	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00
March	4	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00
March	5	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00
March	6	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	7	0.01	11.93	396.69	109.64	384.76	275.13	0.0040	4060.00
March	8	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	9	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	10	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	11	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	12	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	13	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	14	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	15	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	16	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	17	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	18	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	19	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	20	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	21	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	22	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	23	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	24	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	25	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	26	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	27	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	28	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	29	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
March	30	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	31	0.00	0.00	396.69	109.64	396.69	287.06	0.0040	4060.00
April	1	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	2	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	3	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	4	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	5	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	6	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	7	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	8	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	9	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	10	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	11	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	12	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	13	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	14	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	15	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	16	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	17	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	18	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	19	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	20	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	21	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	22	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	23	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
April	24	0.00	0.00	396.69	88.12	396.69	308.58	0.0065	4060.00
April	25	0.01	13.41	396.69	88.12	383.28	295.16	0.0065	4060.00
April	26	0.02	19.00	396.69	88.12	377.70	289.58	0.0065	4060.00
April	27	0.02	29.75	396.69	88.12	366.95	278.83	0.0065	4060.00
April	28	0.02	28.96	396.69	88.12	367.73	279.61	0.0065	4060.00
April	29	0.04	44.36	396.69	88.12	352.33	264.22	0.0065	4060.00
April	30	0.05	61.84	396.69	88.12	334.85	246.74	0.0065	4060.00
May	1	0.05	65.49	396.69	109.64	331.20	221.56	0.0089	4060.00
May	2	0.08	93.94	396.69	109.64	302.76	193.12	0.0089	4060.00
May	3	0.09	108.13	396.69	109.64	288.56	178.92	0.0089	4060.00
May	4	0.09	108.55	396.69	109.64	288.14	178.51	0.0089	4060.00
May	5	0.10	120.24	396.69	109.64	276.45	166.82	0.0089	4060.00
May	6	0.11	127.34	396.69	109.64	269.36	159.72	0.0089	4060.00
May	7	0.07	85.59	396.69	109.64	311.11	201.47	0.0089	4060.00
May	8	0.07	79.74	396.69	109.64	316.95	207.31	0.0089	4060.00
May	9	0.09	110.22	396.69	109.64	286.47	176.84	0.0089	4060.00
May	10	0.09	111.47	396.69	109.64	285.22	175.58	0.0089	4060.00
May	11	0.10	113.98	396.69	109.64	282.72	173.08	0.0089	4060.00
May	12	0.12	142.37	396.69	109.64	254.33	144.69	0.0089	4060.00
May	13	0.09	106.46	396.69	109.64	290.23	180.59	0.0089	4060.00
May	14	0.12	148.21	396.69	109.64	248.48	138.84	0.0089	4060.00
May	15	0.09	102.70	396.69	109.64	293.99	184.35	0.0089	4060.00
May	16	0.09	104.96	396.69	109.64	291.73	182.09	0.0089	4060.00
May	17	0.14	163.88	396.69	109.64	232.81	123.17	0.0089	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
May	18	0.13	158.35	396.69	109.64	238.34	128.71	0.0089	4060.00
May	19	0.08	95.45	396.69	109.64	301.24	191.61	0.0089	4060.00
May	20	0.09	110.51	396.69	109.64	286.18	176.55	0.0089	4060.00
May	21	0.08	96.87	396.69	109.64	299.83	190.19	0.0089	4060.00
May	22	0.09	111.87	396.69	109.64	284.82	175.18	0.0089	4060.00
May	23	0.14	162.38	396.69	109.64	234.32	124.68	0.0089	4060.00
May	24	0.10	115.08	396.69	109.64	281.61	171.98	0.0089	4060.00
May	25	0.08	96.55	396.69	109.64	300.15	190.51	0.0089	4060.00
May	26	0.09	106.98	396.69	109.64	289.71	180.07	0.0089	4060.00
May	27	0.11	134.61	396.69	109.64	262.08	152.44	0.0089	4060.00
May	28	0.13	153.92	396.69	109.64	242.77	133.13	0.0089	4060.00
May	29	0.14	169.92	396.69	109.64	226.77	117.14	0.0089	4060.00
May	30	0.17	198.68	396.69	109.64	198.01	88.37	0.0089	4060.00
May	31	0.17	200.40	396.69	109.64	196.30	86.66	0.0089	4060.00
June	1	0.15	173.11	396.69	125.88	223.58	97.70	0.0112	4060.00
June	2	0.14	171.19	396.69	125.88	225.51	99.63	0.0112	4060.00
June	3	0.16	191.90	396.69	125.88	204.79	78.91	0.0112	4060.00
June	4	0.17	197.27	396.69	125.88	199.43	73.55	0.0112	4060.00
June	5	0.20	238.20	396.69	125.88	158.50	32.62	0.0112	4060.00
June	6	0.22	267.40	396.69	125.88	129.29	3.41	0.0112	4060.00
June	7	0.20	232.60	396.69	125.88	164.09	38.21	0.0112	4060.00
June	8	0.18	212.92	396.69	125.88	183.77	57.89	0.0112	4060.00
June	9	0.21	249.42	396.69	125.88	147.27	21.39	0.0112	4060.00
June	10	0.19	229.17	396.69	125.88	167.52	41.64	0.0112	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day

NGWSP diversion = 37764 acre feet per year

Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS

Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 9662 acres found in ref 1.

crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
June	11	0.20	243.40	396.69	125.88	153.29	27.41	0.0112	4060.00
June	12	0.25	301.88	396.69	125.88	94.81	-31.07	0.0112	4026.67
June	13	0.23	277.07	396.69	125.88	119.63	-6.25	0.0112	4018.15
June	14	0.23	269.82	396.69	125.88	126.87	0.99	0.0112	4016.87
June	15	0.20	234.01	396.69	125.88	162.69	36.81	0.0112	4051.41
June	16	0.24	280.63	396.69	125.88	116.06	-9.82	0.0112	4039.32
June	17	0.20	236.48	396.69	125.88	160.21	34.33	0.0112	4060.00
June	18	0.22	263.77	396.69	125.88	132.93	7.05	0.0112	4060.00
June	19	0.23	279.23	396.69	125.88	117.46	-8.42	0.0112	4049.32
June	20	0.31	366.35	396.69	125.88	30.34	-95.54	0.0112	3951.51
June	21	0.28	338.53	396.69	125.88	58.16	-67.72	0.0112	3881.53
June	22	0.33	394.61	396.69	125.88	2.09	-123.79	0.0112	3755.47
June	23	0.26	313.69	396.69	125.88	83.01	-42.87	0.0112	3710.32
June	24	0.28	333.34	396.69	125.88	63.35	-62.53	0.0112	3645.53
June	25	0.23	279.84	396.69	125.88	116.85	-9.03	0.0112	3634.24
June	26	0.25	294.24	396.69	125.88	102.45	-23.43	0.0112	3608.54
June	27	0.30	355.08	396.69	125.88	41.61	-84.27	0.0112	3522.00
June	28	0.30	352.26	396.69	125.88	44.43	-81.45	0.0112	3438.29
June	29	0.26	312.54	396.69	125.88	84.15	-41.73	0.0112	3394.29
June	30	0.26	315.96	396.69	125.88	80.73	-45.15	0.0112	3346.88
July	1	0.30	357.99	396.69	121.82	38.71	-83.11	0.0116	3261.42
July	2	0.30	361.54	396.69	121.82	35.15	-86.67	0.0116	3172.40
July	3	0.26	310.57	396.69	121.82	86.12	-35.70	0.0116	3134.36
July	4	0.25	294.33	396.69	121.82	102.36	-19.46	0.0116	3112.55

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	5	0.31	369.48	396.69	121.82	27.21	-94.61	0.0116	3015.60
July	6	0.31	373.24	396.69	121.82	23.45	-98.37	0.0116	2914.88
July	7	0.25	299.34	396.69	121.82	97.35	-24.47	0.0116	2888.07
July	8	0.32	375.74	396.69	121.82	20.95	-100.87	0.0116	2784.85
July	9	0.27	316.88	396.69	121.82	79.81	-42.00	0.0116	2740.50
July	10	0.33	390.77	396.69	121.82	5.92	-115.90	0.0116	2622.25
July	11	0.33	392.03	396.69	121.82	4.67	-117.15	0.0116	2502.75
July	12	0.30	359.46	396.69	121.82	37.23	-84.59	0.0116	2415.81
July	13	0.30	356.96	396.69	121.82	39.74	-82.08	0.0116	2331.38
July	14	0.34	410.81	396.69	121.82	(14.12)	-135.94	0.0116	2193.09
July	15	0.26	314.37	396.69	121.82	82.32	-39.50	0.0116	2151.25
July	16	0.24	289.32	396.69	121.82	107.37	-14.45	0.0116	2134.45
July	17	0.25	295.59	396.69	121.82	101.11	-20.71	0.0116	2111.39
July	18	0.26	305.61	396.69	121.82	91.09	-30.73	0.0116	2078.31
July	19	0.29	348.19	396.69	121.82	48.50	-73.32	0.0116	2002.65
July	20	0.31	370.73	396.69	121.82	25.96	-95.86	0.0116	1904.44
July	21	0.28	338.17	396.69	121.82	58.52	-63.30	0.0116	1838.80
July	22	0.25	303.10	396.69	121.82	93.59	-28.23	0.0116	1808.22
July	23	0.30	354.45	396.69	121.82	42.24	-79.58	0.0116	1726.30
July	24	0.27	326.90	396.69	121.82	69.79	-52.02	0.0116	1671.93
July	25	0.31	365.72	396.69	121.82	30.97	-90.85	0.0116	1578.73
July	26	0.31	371.99	396.69	121.82	24.71	-97.11	0.0116	1479.27
July	27	0.36	425.84	396.69	121.82	(29.15)	-150.97	0.0116	1325.95
July	28	0.33	393.28	396.69	121.82	3.41	-118.41	0.0116	1205.20

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	29	0.30	356.96	396.69	121.82	39.74	-82.08	0.0116	1120.76
July	30	0.30	359.46	396.69	121.82	37.23	-84.59	0.0116	1033.83
July	31	0.29	341.93	396.69	121.82	54.77	-67.05	0.0116	964.43
August	1	0.31	365.72	396.69	121.82	30.97	-90.85	0.0091	871.74
August	2	0.29	349.44	396.69	121.82	47.25	-74.57	0.0091	795.33
August	3	0.29	345.68	396.69	121.82	51.01	-70.81	0.0091	722.68
August	4	0.30	353.20	396.69	121.82	43.49	-78.33	0.0091	642.51
August	5	0.30	351.95	396.69	121.82	44.75	-77.07	0.0091	563.60
August	6	0.22	265.53	396.69	121.82	131.17	9.35	0.0091	571.11
August	7	0.26	310.62	396.69	121.82	86.08	-35.74	0.0091	533.52
August	8	0.29	345.28	396.69	121.82	51.41	-70.41	0.0091	461.28
August	9	0.26	315.45	396.69	121.82	81.25	-40.57	0.0091	418.86
August	10	0.28	334.55	396.69	121.82	62.15	-59.67	0.0091	357.35
August	11	0.26	310.39	396.69	121.82	86.30	-35.52	0.0091	319.99
August	12	0.30	358.09	396.69	121.82	38.60	-83.22	0.0091	234.94
August	13	0.30	352.20	396.69	121.82	44.49	-77.33	0.0091	155.77
August	14	0.28	331.00	396.69	121.82	65.69	-56.12	0.0091	97.80
August	15	0.23	269.51	396.69	121.82	127.19	5.37	0.0091	101.33
August	16	0.28	331.01	396.69	121.82	65.68	-56.14	0.0091	43.35
August	17	0.25	293.89	396.69	121.82	102.81	-19.01	0.0091	22.50
August	18	0.23	277.56	396.69	121.82	119.13	-2.69	0.0091	17.97
August	19	0.24	282.66	396.69	121.82	114.03	-7.78	0.0091	8.35
August	20	0.23	273.13	396.69	121.82	123.56	1.74	0.0091	8.25
August	21	0.23	268.90	396.69	121.82	127.80	5.98	0.0091	12.39

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
August	22	0.21	253.75	396.69	121.82	142.95	21.13	0.0091	31.68
August	23	0.19	231.26	396.69	121.82	165.43	43.61	0.0091	73.45
August	24	0.19	230.67	396.69	121.82	166.03	44.21	0.0091	115.82
August	25	0.15	180.27	396.69	121.82	216.42	94.61	0.0091	208.59
August	26	0.16	190.69	396.69	121.82	206.00	84.18	0.0091	290.93
August	27	0.18	212.30	396.69	121.82	184.40	62.58	0.0091	351.67
August	28	0.18	210.42	396.69	121.82	186.28	64.46	0.0091	414.28
August	29	0.16	192.66	396.69	121.82	204.03	82.21	0.0091	494.66
August	30	0.17	197.18	396.69	121.82	199.52	77.70	0.0091	570.52
August	31	0.18	214.17	396.69	121.82	182.52	60.70	0.0091	629.38
September	1	0.14	162.33	396.69	125.88	234.36	108.48	0.0075	736.33
September	2	0.15	175.50	396.69	125.88	221.20	95.32	0.0075	830.12
September	3	0.14	171.40	396.69	125.88	225.30	99.42	0.0075	928.02
September	4	0.13	156.63	396.69	125.88	240.06	114.18	0.0075	1040.67
September	5	0.12	143.44	396.69	125.88	253.25	127.37	0.0075	1166.52
September	6	0.12	148.87	396.69	125.88	247.83	121.95	0.0075	1286.94
September	7	0.13	149.64	396.69	125.88	247.05	121.17	0.0075	1406.59
September	8	0.11	134.13	396.69	125.88	262.56	136.68	0.0075	1541.74
September	9	0.13	155.07	396.69	125.88	241.62	115.74	0.0075	1655.96
September	10	0.13	154.29	396.69	125.88	242.40	116.52	0.0075	1770.95
September	11	0.15	173.68	396.69	125.88	223.02	97.14	0.0075	1866.56
September	12	0.13	155.84	396.69	125.88	240.85	114.97	0.0075	1980.01
September	13	0.11	127.16	396.69	125.88	269.54	143.66	0.0075	2122.14
September	14	0.12	148.09	396.69	125.88	248.60	122.72	0.0075	2243.34

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
September	15	0.10	123.28	396.69	125.88	273.41	147.53	0.0075	2389.34
September	16	0.12	147.32	396.69	125.88	249.38	123.50	0.0075	2511.32
September	17	0.13	159.72	396.69	125.88	236.97	111.09	0.0075	2620.88
September	18	0.14	164.37	396.69	125.88	232.32	106.44	0.0075	2725.80
September	19	0.14	162.05	396.69	125.88	234.65	108.77	0.0075	2833.04
September	20	0.14	161.27	396.69	125.88	235.42	109.54	0.0075	2941.06
September	21	0.14	172.90	396.69	125.88	223.79	97.91	0.0075	3037.44
September	22	0.14	161.27	396.69	125.88	235.42	109.54	0.0075	3145.46
September	23	0.13	155.84	396.69	125.88	240.85	114.97	0.0075	3258.90
September	24	0.14	165.92	396.69	125.88	230.77	104.89	0.0075	3362.27
September	25	0.09	110.10	396.69	125.88	286.59	160.71	0.0075	3521.45
September	26	0.12	144.99	396.69	125.88	251.70	125.82	0.0075	3645.75
September	27	0.16	186.08	396.69	125.88	210.61	84.73	0.0075	3728.96
September	28	0.14	169.80	396.69	125.88	226.89	101.01	0.0075	3828.45
September	29	0.17	203.92	396.69	125.88	192.78	66.90	0.0075	3893.82
September	30	0.13	156.62	396.69	125.88	240.07	114.19	0.0075	4006.49
October	1	0.10	113.98	396.69	97.46	282.72	185.26	0.0044	4060.00
October	2	0.10	121.73	396.69	97.46	274.96	177.51	0.0044	4060.00
October	3	0.11	129.48	396.69	97.46	267.21	169.75	0.0044	4060.00
October	4	0.10	120.95	396.69	97.46	275.74	178.28	0.0044	4060.00
October	5	0.12	139.56	396.69	97.46	257.13	159.67	0.0044	4060.00
October	6	0.12	138.79	396.69	97.46	257.91	160.45	0.0044	4060.00
October	7	0.13	153.52	396.69	97.46	243.17	145.72	0.0044	4060.00
October	8	0.13	160.50	396.69	97.46	236.20	138.74	0.0044	4060.00

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 396.6926 acre feet per day  
 NGWSP diversion = 37764 acre feet per year  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 9662 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
October	9	0.13	154.29	396.69	97.46	242.40	144.94	0.0044	4060.00
October	10	0.12	138.79	396.69	97.46	257.91	160.45	0.0044	4060.00
October	11	0.06	73.66	396.69	97.46	323.03	225.58	0.0044	4060.00
October	12	0.09	111.65	396.69	97.46	285.04	187.59	0.0044	4060.00
October	13	0.10	118.63	396.69	97.46	278.06	180.61	0.0044	4060.00
October	14	0.11	128.71	396.69	97.46	267.99	170.53	0.0044	4060.00
		0.05			37764				
		0.05							

Navajo Gallup Water Supply Project  
 NIIP Coury Alternative winter operations  
 Year 2040

Amarillo Canal Capacity 396.6926 acre feet per day

NGWSP diversion = 37764 acre feet per year

Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 200 CFS

Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 9662 acres found in ref 1.

crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
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- Notes:
1. Evap Trans = Peak EvaporTranspiration for an average 10 day period for year 2000. Data from Keller- Bleisner Engineering
  2. NIIP demand = Niip water demand based on downstream acreage, evapotranspiration, conveyance and irrigation efficiency  
(NIIP demand = ET\*downstream acreage/conveyance efficiency/irrigation efficiency)
  3. NIIP Canal availability = Design flowrate for system at the point of diversion
  4. NGWSP demand = Daily demand based on bell shaped distribution of the yearly demand ref. 4.
  5. NIIP surplus = Water available after NIIP demand is met. (NIIP surplus = NIIP Canal availabilty - NIIP demand).
  6. Available for storage = Excess water available after meeting NIIP and NGWSP needs
  7. Evaporation loss = average evaporation loss based on Navajo Reservoir evaporation.
  8. Cummulative storage = Storage of current day including inflow, outflow and losses.
- There are no losses assumed for conveyance from Navajo Dam through NIIP system assessed to NGWSP because NIIP's current operations reflect total losses and additional water would not increase existing losses(i.e. NIIP operates at full canal level).

- Reference:
1. "Navajo Indian Irrigation Project, Gallegos Needs and Cost Assessment", May 1995, Keller-Bleisner Engineering
  2. "Technical Memorandum No. GG-8311-2, "Gallegos Dam, Reconnaissance Design Summary", February 1995, Technical Service Center, Bureau of Reclamation
  3. Navajo Nation Department of Water Resources.
  4. Navajo Tribal Utility Authority memorandum.

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix D.2**

**NIIP Coury Alternative  
O&M Costs  
Year 2020 and 2040**

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Coury Alternative Year 2020  
 November 15, 2001

Estimated Present Cost Index=  
 based on 1977 = 1.00 3.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$3,320.45
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	\$8,866.97
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
						Grand Total \$12,187

NOTES:

Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 43cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT

KUTZ PUMPING PLANT  
O&M COSTS FOR NIIP KUTZ ONLY

9662 ACRES @ 2.96 ACRE-FEET/ACRE

UNATTENDED PLANT

CAPACITY	200. CFS	DESIGN HEAD	370. FT
HORSEPOWER	11024.	PUMP EFFICIENCY	.76
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	28600. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	14223240.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	8227.

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COST OF OPERATION

LABOR COST \$ 5745.  
OTHER COST \$ 1838.  
TOTAL \$ 7583.

COST OF MAINTENANCE

LABOR COST \$ 21022.  
OTHER COST \$ 15879.  
TOTAL \$ 36901.

**ANNUAL O. & M. COST \$ 44484.**

ENERGY

KWH COST \$ 115208.

DEMAND COST \$226409.

**ANNUAL ENERGY COST \$ 341618.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 1400000.	\$ 9197.
STRUCTURES AND IMPROVEMENTS	\$ 2000000.	\$ 159.
MISCELLANEOUS EQUIPMENT	\$ 500000.	\$ 612.
ACCESSORY ELECTRIC EQUIPMENT	\$ 1500000.	\$ 29670.

**ANNUAL REPLACEMENT COST \$ 39638.**

**TOTAL ANNUAL COST \$ 425740.**

NAVAJO GALLUP WATER SUPPLY PROJECT

KUTZ PUMPING PLANT YEAR 2020

O&M COSTS FOR KUTZ NIIP AND NGWSP IRRIGATION SEASON  
October 23, 2001

9662 ACRES @ 2.96 ACRE-FEET/ACRE FOR NIIP AND 16,478 FOR NGWSP

UNATTENDED PLANT

CAPACITY	200. CFS	DESIGN HEAD	370. FT
HORSEPOWER	11024.	PUMP EFFICIENCY	.76
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	45078. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	22418020.
DEMAND CHARGE	3.44	DEMAND KW REQ'D	8227.

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COST OF OPERATION

LABOR COST \$ 5745.  
OTHER COST \$ 1838.  
TOTAL \$ 7583.

**ANNUAL O. & M. COST \$ 52458.**

COST OF MAINTENANCE

LABOR COST \$ 25565.  
OTHER COST \$ 19310.  
TOTAL \$ 44875.

ENERGY

KWH COST \$ 181586.

DEMAND COST \$226409.

**ANNUAL ENERGY COST \$ 407995.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 1400000.	\$ 9197.
STRUCTURES AND IMPROVEMENTS	\$ 2000000.	\$ 159.
MISCELLANEOUS EQUIPMENT	\$ 500000.	\$ 612.
ACCESSORY ELECTRIC EQUIPMENT	\$ 1500000.	\$ 29670.

**ANNUAL REPLACEMENT COST \$ 39638.**

**TOTAL ANNUAL COST \$ 500091.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT

KUTZ PUMPING PLANT YEAR 2020

O&M COSTS FOR KUTZ NGWSP NON-IRRIGATION SEASON  
October 23, 2001

7,449 ACRE-FEET FOR NGWSP

UNATTENDED PLANT

CAPACITY	200. CFS	DESIGN HEAD	370. FT
HORSEPOWER	11024.	PUMP EFFICIENCY	.76
PERIOD OF OPERATION	20 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	7449. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	3704509.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	8227.

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COST OF OPERATION

LABOR COST \$ 4896.  
OTHER COST \$ 1566.  
TOTAL \$ 6463.

**ANNUAL O. & M. COST \$ 27155.**

COST OF MAINTENANCE

LABOR COST \$ 11788.  
OTHER COST \$ 8904.  
TOTAL \$ 20692.

ENERGY

KWH COST \$ 30007.

DEMAND COST \$141506.

**ANNUAL ENERGY COST \$ 171512.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 1400000.	\$ 9197.
STRUCTURES AND IMPROVEMENTS	\$ 2000000.	\$ 159.
MISCELLANEOUS EQUIPMENT	\$ 500000.	\$ 612.
ACCESSORY ELECTRIC EQUIPMENT	\$ 1500000.	\$ 29670.

**ANNUAL REPLACEMENT COST \$ 39638.**

**TOTAL ANNUAL COST \$ 238305.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Coury Alternative Year 2040  
 November 15, 2001

Estimated Present Cost Index= 3.00  
 based on 1977 = 1.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$5,173.73
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$26,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	\$13,815.98
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Bumham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	
Bumham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Bumham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
Grand Total						\$18,990

NOTES:  
 Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 67cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT

KUTZ PUMPING PLANT YEAR 2040

O&M COSTS FOR NIIP KUTZ AND NGWSP IRRIGATION SEASON

October 19, 2001

9662 ACRES @ 2.96 ACRE-FEET/ACRE FOR NIIP AND 26,008 FOR NGWSP

UNATTENDED PLANT

CAPACITY	200. CFS	DESIGN HEAD	370. FT
HORSEPOWER	11024.	PUMP EFFICIENCY	.76
PERIOD OF OPERATION	32 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	54608. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	27157440.
DEMAND CHARGE	3.44	DEMAND KW REQ'D	8227.

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COST OF OPERATION

LABOR COST \$ 5745.

OTHER COST \$ 1838.

TOTAL \$ 7583.

**ANNUAL O. & M. COST \$ 56315.**

COST OF MAINTENANCE

LABOR COST \$ 27763.

OTHER COST \$ 20970.

TOTAL \$ 48733.

ENERGY

KWH COST \$ 219975.

DEMAND COST \$226409.

**ANNUAL ENERGY COST \$ 446385.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 1400000.	\$ 9197.
STRUCTURES AND IMPROVEMENTS	\$ 2000000.	\$ 159.
MISCELLANEOUS EQUIPMENT	\$ 500000.	\$ 612.
ACCESSORY ELECTRIC EQUIPMENT	\$ 1500000.	\$ 29670.

**ANNUAL REPLACEMENT COST \$ 39638.**

**TOTAL ANNUAL COST \$ 542339.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT

KUTZ PUMPING PLANT YEAR 2040

O&M COSTS FOR NGWSP ONLY DURING NON-IRRIGATION SEASON

October 19, 2001

11,756 FOR NGWSP

UNATTENDED PLANT

CAPACITY	200.	CFS DESIGN HEAD	370. FT
HORSEPOWER	11024.	PUMP EFFICIENCY	.76
PERIOD OF OPERATION	20 WKS	OPERATORS WAGE	\$ 15.00 /HR
COST INDEX(1962=1.0)	5.60	MECHANICS WAGE	\$ 15.00 /HR
ANNUAL DIVERSION	11756. AF	INTEREST RATE	.064
COST PER KWH	.0081	KWH REQUIRED	5846450.
DEMAND CHARGE	3.44	DEMAND KW REQ"D	8227.

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COST OF OPERATION

LABOR COST \$ 4896.

OTHER COST \$ 1566.

TOTAL \$ 6463.

**ANNUAL O. & M. COST \$ 31640.**

COST OF MAINTENANCE

LABOR COST \$ 14344.

OTHER COST \$ 10834.

TOTAL \$ 25178.

ENERGY

KWH COST \$ 47356.

DEMAND COST \$141506.

**ANNUAL ENERGY COST \$ 188862.**

REPLACEMENTS

ITEM	ESTIMATED COST	REPLACEMENT COST
PUMPS AND PRIME MOVERS	\$ 1400000.	\$ 9197.
STRUCTURES AND IMPROVEMENTS	\$ 2000000.	\$ 159.
MISCELLANEOUS EQUIPMENT	\$ 500000.	\$ 612.
ACCESSORY ELECTRIC EQUIPMENT	\$ 1500000.	\$ 29670.

**ANNUAL REPLACEMENT COST \$ 39638.**

**TOTAL ANNUAL COST \$ 260141.**

"PMPOM" BUREAU OF RECLAMATION PROGRAM RESULTS

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix D.3**

**NIIP Coury Alternative  
Winterization Costs**



NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix E**

**NIIP Amarillo Alternative**

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix E.1**

**NIIP Amarillo Alternative  
Operational Model**

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
								20	
October	15	0.06	63.67	337.19	53.43	273.52	220.09	0.0044	1720.00
October	16	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	17	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	18	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	19	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	20	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	21	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	22	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	23	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	24	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	25	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	26	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	27	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	28	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	29	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	30	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
October	31	0	0.00	337.19	53.43	337.19	283.76	0.0044	1720.00
November	1	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	2	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	3	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	4	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	5	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day

NGWSP diversion = 20704 acre feet per year(does not include east lateral)

Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS

Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 8455 acres found in ref 1.

crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
November	6	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	7	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	8	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	9	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	10	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	11	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	12	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	13	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	14	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	15	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	16	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	17	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	18	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	19	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	20	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	21	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	22	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	23	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	24	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	25	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	26	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	27	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	28	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
November	29	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
November	30	0	0.00	337.19	48.31	337.19	288.88	0.0022	1720.00
December	1	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	2	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	3	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	4	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	5	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	6	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	7	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	8	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	9	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	10	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	11	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	12	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	13	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	14	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	15	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	16	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	17	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	18	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	19	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	20	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	21	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	22	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	23	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	24	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	25	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	26	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	27	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	28	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	29	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	30	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
December	31	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	1	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	2	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	3	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	4	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	5	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	6	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	7	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	8	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	9	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	10	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	11	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	12	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	13	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
January	14	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	15	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	16	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	17	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	18	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	19	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	20	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	21	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	22	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	23	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	24	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	25	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	26	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	27	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	28	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	29	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	30	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
January	31	0	0.00	337.19	46.75	337.19	290.44	0.0015	1720.00
February	1	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	2	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	3	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	4	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	5	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
February	6	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	7	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	8	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	9	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	10	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	11	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	12	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	13	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	14	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	15	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	16	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	17	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	18	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	19	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	20	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	21	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	22	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	23	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	24	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	25	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	26	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	27	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00
February	28	0	0.00	337.19	44.37	337.19	292.82	0.0021	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	1	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	2	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	3	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	4	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	5	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	6	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	7	0.01	10.44	337.19	60.11	326.75	266.64	0.0040	1720.00
March	8	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	9	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	10	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	11	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	12	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	13	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	14	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	15	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	16	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	17	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	18	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	19	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	20	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	21	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	22	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	23	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	24	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	25	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	26	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	27	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	28	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	29	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	30	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
March	31	0.00	0.00	337.19	60.11	337.19	277.08	0.0040	1720.00
April	1	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	2	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	3	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	4	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	5	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	6	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	7	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	8	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	9	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	10	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	11	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	12	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	13	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	14	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	15	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
April	16	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	17	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	18	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	19	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	20	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	21	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	22	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	23	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	24	0.00	0.00	337.19	48.31	337.19	288.88	0.0065	1720.00
April	25	0.01	11.74	337.19	48.31	325.45	277.14	0.0065	1720.00
April	26	0.02	16.62	337.19	48.31	320.57	272.26	0.0065	1720.00
April	27	0.02	26.03	337.19	48.31	311.16	262.85	0.0065	1720.00
April	28	0.02	25.35	337.19	48.31	311.84	263.53	0.0065	1720.00
April	29	0.04	38.82	337.19	48.31	298.37	250.06	0.0065	1720.00
April	30	0.05	54.12	337.19	48.31	283.07	234.76	0.0065	1720.00
May	1	0.05	57.31	337.19	60.11	279.88	219.77	0.0089	1720.00
May	2	0.08	82.20	337.19	60.11	254.99	194.88	0.0089	1720.00
May	3	0.09	94.62	337.19	60.11	242.57	182.46	0.0089	1720.00
May	4	0.09	94.99	337.19	60.11	242.20	182.09	0.0089	1720.00
May	5	0.10	105.22	337.19	60.11	231.97	171.86	0.0089	1720.00
May	6	0.11	111.43	337.19	60.11	225.76	165.65	0.0089	1720.00
May	7	0.07	74.89	337.19	60.11	262.29	202.19	0.0089	1720.00
May	8	0.07	69.78	337.19	60.11	267.41	207.30	0.0089	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
May	9	0.09	96.45	337.19	60.11	240.74	180.63	0.0089	1720.00
May	10	0.09	97.55	337.19	60.11	239.64	179.53	0.0089	1720.00
May	11	0.10	99.74	337.19	60.11	237.45	177.34	0.0089	1720.00
May	12	0.12	124.58	337.19	60.11	212.61	152.50	0.0089	1720.00
May	13	0.09	93.16	337.19	60.11	244.03	183.92	0.0089	1720.00
May	14	0.12	129.70	337.19	60.11	207.49	147.38	0.0089	1720.00
May	15	0.09	89.87	337.19	60.11	247.32	187.21	0.0089	1720.00
May	16	0.09	91.85	337.19	60.11	245.34	185.23	0.0089	1720.00
May	17	0.14	143.41	337.19	60.11	193.78	133.67	0.0089	1720.00
May	18	0.13	138.57	337.19	60.11	198.62	138.51	0.0089	1720.00
May	19	0.08	83.53	337.19	60.11	253.66	193.55	0.0089	1720.00
May	20	0.09	96.70	337.19	60.11	240.48	180.38	0.0089	1720.00
May	21	0.08	84.77	337.19	60.11	252.42	192.32	0.0089	1720.00
May	22	0.09	97.90	337.19	60.11	239.29	179.18	0.0089	1720.00
May	23	0.14	142.09	337.19	60.11	195.10	134.99	0.0089	1720.00
May	24	0.10	100.70	337.19	60.11	236.49	176.38	0.0089	1720.00
May	25	0.08	84.48	337.19	60.11	252.70	192.60	0.0089	1720.00
May	26	0.09	93.62	337.19	60.11	243.57	183.46	0.0089	1720.00
May	27	0.11	117.80	337.19	60.11	219.39	159.28	0.0089	1720.00
May	28	0.13	134.69	337.19	60.11	202.50	142.39	0.0089	1720.00
May	29	0.14	148.69	337.19	60.11	188.50	128.39	0.0089	1720.00
May	30	0.17	173.86	337.19	60.11	163.33	103.22	0.0089	1720.00
May	31	0.17	175.36	337.19	60.11	161.83	101.72	0.0089	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day

NGWSP diversion = 20704 acre feet per year(does not include east lateral)

Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS

Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 8455 acres found in ref 1.

crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
June	1	0.15	151.49	337.19	69.01	185.70	116.69	0.0112	1720.00
June	2	0.14	149.80	337.19	69.01	187.39	118.37	0.0112	1720.00
June	3	0.16	167.93	337.19	69.01	169.26	100.25	0.0112	1720.00
June	4	0.17	172.62	337.19	69.01	164.57	95.55	0.0112	1720.00
June	5	0.20	208.44	337.19	69.01	128.75	59.74	0.0112	1720.00
June	6	0.22	234.00	337.19	69.01	103.19	34.18	0.0112	1720.00
June	7	0.20	203.55	337.19	69.01	133.64	64.63	0.0112	1720.00
June	8	0.18	186.32	337.19	69.01	150.87	81.85	0.0112	1720.00
June	9	0.21	218.26	337.19	69.01	118.92	49.91	0.0112	1720.00
June	10	0.19	200.55	337.19	69.01	136.64	67.63	0.0112	1720.00
June	11	0.20	212.99	337.19	69.01	124.20	55.18	0.0112	1720.00
June	12	0.25	264.17	337.19	69.01	73.02	4.01	0.0112	1720.00
June	13	0.23	242.45	337.19	69.01	94.73	25.72	0.0112	1720.00
June	14	0.23	236.11	337.19	69.01	101.08	32.06	0.0112	1720.00
June	15	0.20	204.77	337.19	69.01	132.42	63.40	0.0112	1720.00
June	16	0.24	245.57	337.19	69.01	91.62	22.60	0.0112	1720.00
June	17	0.20	206.94	337.19	69.01	130.25	61.24	0.0112	1720.00
June	18	0.22	230.82	337.19	69.01	106.37	37.36	0.0112	1720.00
June	19	0.23	244.35	337.19	69.01	92.84	23.83	0.0112	1720.00
June	20	0.31	320.59	337.19	69.01	16.60	-52.41	0.0112	1666.63
June	21	0.28	296.24	337.19	69.01	40.95	-28.06	0.0112	1637.61
June	22	0.33	345.31	337.19	69.01	(8.12)	-77.14	0.0112	1559.51
June	23	0.26	274.50	337.19	69.01	62.69	-6.33	0.0112	1552.22

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
June	24	0.28	291.70	337.19	69.01	45.49	-23.52	0.0112	1527.74
June	25	0.23	244.88	337.19	69.01	92.31	23.29	0.0112	1550.07
June	26	0.25	257.49	337.19	69.01	79.70	10.69	0.0112	1559.80
June	27	0.30	310.72	337.19	69.01	26.47	-42.55	0.0112	1516.30
June	28	0.30	308.26	337.19	69.01	28.93	-40.08	0.0112	1475.26
June	29	0.26	273.50	337.19	69.01	63.69	-5.32	0.0112	1468.97
June	30	0.26	276.49	337.19	69.01	60.70	-8.31	0.0112	1459.70
July	1	0.30	313.27	337.19	66.79	23.92	-42.86	0.0116	1415.84
July	2	0.30	316.38	337.19	66.79	20.81	-45.98	0.0116	1368.87
July	3	0.26	271.77	337.19	66.79	65.42	-1.37	0.0116	1366.50
July	4	0.25	257.56	337.19	66.79	79.62	12.84	0.0116	1378.35
July	5	0.31	323.33	337.19	66.79	13.86	-52.92	0.0116	1324.43
July	6	0.31	326.61	337.19	66.79	10.58	-56.21	0.0116	1267.22
July	7	0.25	261.95	337.19	66.79	75.24	8.45	0.0116	1274.68
July	8	0.32	328.81	337.19	66.79	8.38	-58.40	0.0116	1215.28
July	9	0.27	277.29	337.19	66.79	59.90	-6.89	0.0116	1207.40
July	10	0.33	341.96	337.19	66.79	(4.77)	-71.56	0.0116	1134.85
July	11	0.33	343.05	337.19	66.79	(5.87)	-72.65	0.0116	1061.20
July	12	0.30	314.56	337.19	66.79	22.63	-44.16	0.0116	1016.05
July	13	0.30	312.37	337.19	66.79	24.82	-41.96	0.0116	973.09
July	14	0.34	359.49	337.19	66.79	(22.31)	-89.09	0.0116	883.01
July	15	0.26	275.10	337.19	66.79	62.09	-4.70	0.0116	877.31
July	16	0.24	253.18	337.19	66.79	84.01	17.22	0.0116	893.54

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	17	0.25	258.66	337.19	66.79	78.53	11.74	0.0116	904.29
July	18	0.26	267.43	337.19	66.79	69.76	2.97	0.0116	906.27
July	19	0.29	304.69	337.19	66.79	32.50	-34.29	0.0116	870.98
July	20	0.31	324.42	337.19	66.79	12.77	-54.02	0.0116	815.97
July	21	0.28	295.93	337.19	66.79	41.26	-25.52	0.0116	789.45
July	22	0.25	265.24	337.19	66.79	71.95	5.17	0.0116	793.62
July	23	0.30	310.17	337.19	66.79	27.02	-39.77	0.0116	752.85
July	24	0.27	286.06	337.19	66.79	51.13	-15.66	0.0116	736.20
July	25	0.31	320.04	337.19	66.79	17.15	-49.64	0.0116	685.57
July	26	0.31	325.52	337.19	66.79	11.67	-55.12	0.0116	629.46
July	27	0.36	372.65	337.19	66.79	(35.46)	-102.24	0.0116	526.22
July	28	0.33	344.15	337.19	66.79	(6.96)	-73.75	0.0116	451.48
July	29	0.30	312.37	337.19	66.79	24.82	-41.96	0.0116	408.52
July	30	0.30	314.56	337.19	66.79	22.63	-44.16	0.0116	363.37
July	31	0.29	299.21	337.19	66.79	37.98	-28.81	0.0116	333.57
August	1	0.31	320.04	337.19	66.79	17.15	-49.64	0.0091	283.15
August	2	0.29	305.79	337.19	66.79	31.40	-35.39	0.0091	246.98
August	3	0.29	302.50	337.19	66.79	34.69	-32.10	0.0091	214.10
August	4	0.30	309.08	337.19	66.79	28.11	-38.68	0.0091	174.65
August	5	0.30	307.98	337.19	66.79	29.21	-37.58	0.0091	136.29
August	6	0.22	232.36	337.19	66.79	104.83	38.05	0.0091	173.56
August	7	0.26	271.81	337.19	66.79	65.38	-1.41	0.0091	171.37
August	8	0.29	302.15	337.19	66.79	35.04	-31.75	0.0091	138.84

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
August	9	0.26	276.04	337.19	66.79	61.15	-5.64	0.0091	132.42
August	10	0.28	292.75	337.19	66.79	44.43	-22.35	0.0091	109.29
August	11	0.26	271.62	337.19	66.79	65.57	-1.22	0.0091	107.30
August	12	0.30	313.36	337.19	66.79	23.83	-42.96	0.0091	63.56
August	13	0.30	308.20	337.19	66.79	28.99	-37.80	0.0091	24.98
August	14	0.28	289.65	337.19	66.79	47.54	-19.25	0.0091	4.95
August	15	0.23	235.84	337.19	66.79	101.35	34.56	0.0091	38.74
August	16	0.28	289.66	337.19	66.79	47.53	-19.26	0.0091	18.70
August	17	0.25	257.17	337.19	66.79	80.02	13.23	0.0091	31.15
August	18	0.23	242.89	337.19	66.79	94.30	27.52	0.0091	57.88
August	19	0.24	247.35	337.19	66.79	89.84	23.05	0.0091	80.16
August	20	0.23	239.01	337.19	66.79	98.18	31.39	0.0091	110.77
August	21	0.23	235.30	337.19	66.79	101.88	35.10	0.0091	145.09
August	22	0.21	222.05	337.19	66.79	115.14	48.35	0.0091	192.66
August	23	0.19	202.37	337.19	66.79	134.82	68.03	0.0091	259.91
August	24	0.19	201.85	337.19	66.79	135.34	68.55	0.0091	327.68
August	25	0.15	157.75	337.19	66.79	179.44	112.65	0.0091	439.56
August	26	0.16	166.87	337.19	66.79	170.32	103.53	0.0091	542.31
August	27	0.18	185.78	337.19	66.79	151.41	84.63	0.0091	626.16
August	28	0.18	184.13	337.19	66.79	153.06	86.27	0.0091	711.65
August	29	0.16	168.59	337.19	66.79	168.60	101.81	0.0091	812.68
August	30	0.17	172.54	337.19	66.79	164.64	97.86	0.0091	909.76
August	31	0.18	187.42	337.19	66.79	149.77	82.98	0.0091	991.96

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day

NGWSP diversion = 20704 acre feet per year(does not include east lateral)

Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 150 CFS

Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 8455 acres found in ref 1.

crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
September	1	0.14	142.05	337.19	69.01	195.14	126.12	0.0075	1117.44
September	2	0.15	153.57	337.19	69.01	183.62	114.60	0.0075	1231.40
September	3	0.14	149.98	337.19	69.01	187.20	118.19	0.0075	1348.94
September	4	0.13	137.07	337.19	69.01	200.12	131.11	0.0075	1479.40
September	5	0.12	125.52	337.19	69.01	211.67	142.66	0.0075	1621.41
September	6	0.12	130.27	337.19	69.01	206.92	137.91	0.0075	1720.00
September	7	0.13	130.95	337.19	69.01	206.24	137.23	0.0075	1720.00
September	8	0.11	117.38	337.19	69.01	219.81	150.80	0.0075	1720.00
September	9	0.13	135.70	337.19	69.01	201.49	132.48	0.0075	1720.00
September	10	0.13	135.02	337.19	69.01	202.17	133.16	0.0075	1720.00
September	11	0.15	151.98	337.19	69.01	185.21	116.19	0.0075	1720.00
September	12	0.13	136.38	337.19	69.01	200.81	131.80	0.0075	1720.00
September	13	0.11	111.27	337.19	69.01	225.92	156.90	0.0075	1720.00
September	14	0.12	129.59	337.19	69.01	207.60	138.58	0.0075	1720.00
September	15	0.10	107.88	337.19	69.01	229.31	160.30	0.0075	1720.00
September	16	0.12	128.91	337.19	69.01	208.28	139.26	0.0075	1720.00
September	17	0.13	139.77	337.19	69.01	197.42	128.41	0.0075	1720.00
September	18	0.14	143.84	337.19	69.01	193.35	124.34	0.0075	1720.00
September	19	0.14	141.80	337.19	69.01	195.38	126.37	0.0075	1720.00
September	20	0.14	141.13	337.19	69.01	196.06	127.05	0.0075	1720.00
September	21	0.14	151.30	337.19	69.01	185.89	116.87	0.0075	1720.00
September	22	0.14	141.13	337.19	69.01	196.06	127.05	0.0075	1720.00
September	23	0.13	136.38	337.19	69.01	200.81	131.80	0.0075	1720.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 20704 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
September	24	0.14	145.20	337.19	69.01	191.99	122.98	0.0075	1720.00
September	25	0.09	96.35	337.19	69.01	240.84	171.83	0.0075	1720.00
September	26	0.12	126.88	337.19	69.01	210.31	141.30	0.0075	1720.00
September	27	0.16	162.84	337.19	69.01	174.35	105.34	0.0075	1720.00
September	28	0.14	148.59	337.19	69.01	188.60	119.59	0.0075	1720.00
September	29	0.17	178.44	337.19	69.01	158.75	89.73	0.0075	1720.00
September	30	0.13	137.05	337.19	69.01	200.13	131.12	0.0075	1720.00
October	1	0.10	99.74	337.19	53.43	237.45	184.02	0.0044	1720.00
October	2	0.10	106.52	337.19	53.43	230.67	177.24	0.0044	1720.00
October	3	0.11	113.31	337.19	53.43	223.88	170.45	0.0044	1720.00
October	4	0.10	105.84	337.19	53.43	231.34	177.91	0.0044	1720.00
October	5	0.12	122.13	337.19	53.43	215.06	161.63	0.0044	1720.00
October	6	0.12	121.45	337.19	53.43	215.74	162.31	0.0044	1720.00
October	7	0.13	134.34	337.19	53.43	202.85	149.42	0.0044	1720.00
October	8	0.13	140.45	337.19	53.43	196.74	143.31	0.0044	1720.00
October	9	0.13	135.02	337.19	53.43	202.17	148.74	0.0044	1720.00
October	10	0.12	121.45	337.19	53.43	215.74	162.31	0.0044	1720.00
October	11	0.06	64.46	337.19	53.43	272.73	219.30	0.0044	1720.00
October	12	0.09	97.70	337.19	53.43	239.49	186.06	0.0044	1720.00
October	13	0.10	103.81	337.19	53.43	233.38	179.95	0.0044	1720.00
October	14	0.11	112.63	337.19	53.43	224.56	171.13	0.0044	1720.00
		0.05			20704				
		0.05							

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2020

Amarillo Canal Capacity 337,188.71 acre feet per day  
 NGWSP diversion = 20704 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 150 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
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- Notes:
1. Evap Trans = Peak EvaporTranspiration for an average 10 day period for year 2000. Data from Keller- Bleisner Engineering
  2. NIIP demand = Niip water demand based on downstream acreage, evaportranspiration, conveyance and irrigation efficiency  
 (NIIP demand =  $ET * \text{downstream acreage} / \text{conveyance efficiency} / \text{irrigation efficiency}$ )
  3. NIIP Canal availability = Design flowrate for system at the point of diversion
  4. NGWSP demand = Daily demand based on bell shaped distribution of the yearly demand ref. 4.
  5. NIIP surplus = Water available after NIIP demand is met. (NIIP surplus = NIIP Canal availability - NIIP demand).
  6. Available for storage = Excess water available after meeting NIIP and NGWSP needs
  7. Evaporation loss = average evaporation loss based on Navajo Reservoir evaporation.
  8. Cummulative storage = Storage of current day including inflow, outflow and losses.
- There are no losses assumed for conveyance from Navajo Dam through NIIP system assessed to NGWSP because NIIP's current operations reflect total losses and additional water would not increase existing losses (i.e. NIIP operates at full canal level).

- Reference:
1. "Navajo Indian Irrigation Project, Gallegos Needs and Cost Assessment", May 1995, Keller-Bleisner Engineering
  2. "Technical Memorandum No. GG-8311-2, "Gallegos Dam, Reconnaissance Design Summary", February 1995, Technical Service Center, Bureau of Reclamation
  3. Navajo Nation Department of Water Resources.
  4. Navajo Tribal Utility Authority memorandum.



Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
October	15	0.06	63.67	337.19	85.47	273.52	188.046866	0.0044	4280.00
October	16	0	0.00	337.19	85.47	337.19	251.720323	0.0044	4280.00
October	17	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	18	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	19	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	20	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	21	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	22	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	23	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	24	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	25	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	26	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	27	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	28	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	29	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	30	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
October	31	0	0.00	337.19	85.47	337.19	251.72	0.0044	4280.00
November	1	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	2	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	3	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	4	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	5	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	6	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day

NGWSP diversion = 33119 acre feet per year(does not include east lateral)

Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS

Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 8455 acres found in ref 1.

crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
November	7	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	8	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	9	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	10	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	11	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	12	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	13	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	14	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	15	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	16	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	17	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	18	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	19	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	20	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	21	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	22	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	23	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	24	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	25	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	26	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	27	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	28	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	29	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00
November	30	0	0.00	337.19	77.28	337.19	259.91	0.0022	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	1	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	2	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	3	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	4	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	5	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	6	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	7	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	8	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	9	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	10	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	11	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	12	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	13	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	14	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	15	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	16	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	17	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	18	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	19	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	20	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	21	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	22	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	23	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	24	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
December	25	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	26	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	27	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	28	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	29	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	30	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
December	31	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	1	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	2	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	3	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	4	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	5	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	6	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	7	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	8	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	9	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	10	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	11	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	12	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	13	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	14	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	15	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	16	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	17	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
January	18	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	19	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	20	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	21	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	22	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	23	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	24	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	25	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	26	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	27	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	28	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	29	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	30	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
January	31	0	0.00	337.19	74.78	337.19	262.40	0.0015	4280.00
February	1	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	2	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	3	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	4	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	5	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	6	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	7	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	8	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	9	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	10	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
February	11	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	12	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	13	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	14	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	15	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	16	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	17	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	18	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	19	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	20	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	21	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	22	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	23	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	24	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	25	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	26	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	27	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
February	28	0	0.00	337.19	70.97	337.19	266.22	0.0021	4280.00
March	1	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00
March	2	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00
March	3	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00
March	4	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00
March	5	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00
March	6	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	7	0.01	10.44	337.19	96.15	326.75	230.60	0.0040	4280.00
March	8	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	9	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	10	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	11	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	12	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	13	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	14	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	15	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	16	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	17	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	18	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	19	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	20	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	21	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	22	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	23	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	24	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	25	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	26	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	27	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	28	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	29	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
March	30	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year (does not include east lateral)  
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 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
March	31	0.00	0.00	337.19	96.15	337.19	241.04	0.0040	4280.00
April	1	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	2	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	3	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	4	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	5	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	6	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	7	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	8	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	9	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	10	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	11	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	12	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	13	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	14	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	15	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	16	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	17	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	18	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	19	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	20	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	21	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	22	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	23	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] coveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
April	24	0.00	0.00	337.19	77.28	337.19	259.91	0.0065	4280.00
April	25	0.01	11.74	337.19	77.28	325.45	248.17	0.0065	4280.00
April	26	0.02	16.62	337.19	77.28	320.57	243.29	0.0065	4280.00
April	27	0.02	26.03	337.19	77.28	311.16	233.88	0.0065	4280.00
April	28	0.02	25.35	337.19	77.28	311.84	234.57	0.0065	4280.00
April	29	0.04	38.82	337.19	77.28	298.37	221.09	0.0065	4280.00
April	30	0.05	54.12	337.19	77.28	283.07	205.80	0.0065	4280.00
May	1	0.05	57.31	337.19	96.15	279.88	183.72	0.0089	4280.00
May	2	0.08	82.20	337.19	96.15	254.99	158.84	0.0089	4280.00
May	3	0.09	94.62	337.19	96.15	242.57	146.41	0.0089	4280.00
May	4	0.09	94.99	337.19	96.15	242.20	146.05	0.0089	4280.00
May	5	0.10	105.22	337.19	96.15	231.97	135.82	0.0089	4280.00
May	6	0.11	111.43	337.19	96.15	225.76	129.61	0.0089	4280.00
May	7	0.07	74.89	337.19	96.15	262.29	166.14	0.0089	4280.00
May	8	0.07	69.78	337.19	96.15	267.41	171.26	0.0089	4280.00
May	9	0.09	96.45	337.19	96.15	240.74	144.59	0.0089	4280.00
May	10	0.09	97.55	337.19	96.15	239.64	143.49	0.0089	4280.00
May	11	0.10	99.74	337.19	96.15	237.45	141.30	0.0089	4280.00
May	12	0.12	124.58	337.19	96.15	212.61	116.46	0.0089	4280.00
May	13	0.09	93.16	337.19	96.15	244.03	147.88	0.0089	4280.00
May	14	0.12	129.70	337.19	96.15	207.49	111.34	0.0089	4280.00
May	15	0.09	89.87	337.19	96.15	247.32	151.16	0.0089	4280.00
May	16	0.09	91.85	337.19	96.15	245.34	149.19	0.0089	4280.00
May	17	0.14	143.41	337.19	96.15	193.78	97.63	0.0089	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
May	18	0.13	138.57	337.19	96.15	198.62	102.47	0.0089	4280.00
May	19	0.08	83.53	337.19	96.15	253.66	157.51	0.0089	4280.00
May	20	0.09	96.70	337.19	96.15	240.48	144.33	0.0089	4280.00
May	21	0.08	84.77	337.19	96.15	252.42	156.27	0.0089	4280.00
May	22	0.09	97.90	337.19	96.15	239.29	143.14	0.0089	4280.00
May	23	0.14	142.09	337.19	96.15	195.10	98.95	0.0089	4280.00
May	24	0.10	100.70	337.19	96.15	236.49	140.33	0.0089	4280.00
May	25	0.08	84.48	337.19	96.15	252.70	156.55	0.0089	4280.00
May	26	0.09	93.62	337.19	96.15	243.57	147.42	0.0089	4280.00
May	27	0.11	117.80	337.19	96.15	219.39	123.24	0.0089	4280.00
May	28	0.13	134.69	337.19	96.15	202.50	106.34	0.0089	4280.00
May	29	0.14	148.69	337.19	96.15	188.50	92.34	0.0089	4280.00
May	30	0.17	173.86	337.19	96.15	163.33	67.17	0.0089	4280.00
May	31	0.17	175.36	337.19	96.15	161.83	65.67	0.0089	4280.00
June	1	0.15	151.49	337.19	110.40	185.70	75.31	0.0112	4280.00
June	2	0.14	149.80	337.19	110.40	187.39	76.99	0.0112	4280.00
June	3	0.16	167.93	337.19	110.40	169.26	58.87	0.0112	4280.00
June	4	0.17	172.62	337.19	110.40	164.57	54.17	0.0112	4280.00
June	5	0.20	208.44	337.19	110.40	128.75	18.35	0.0112	4280.00
June	6	0.22	234.00	337.19	110.40	103.19	-7.21	0.0112	4270.40
June	7	0.20	203.55	337.19	110.40	133.64	23.25	0.0112	4280.00
June	8	0.18	186.32	337.19	110.40	150.87	40.47	0.0112	4280.00
June	9	0.21	218.26	337.19	110.40	118.92	8.53	0.0112	4280.00
June	10	0.19	200.55	337.19	110.40	136.64	26.25	0.0112	4280.00

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
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 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
June	11	0.20	212.99	337.19	110.40	124.20	13.80	0.0112	4280.00
June	12	0.25	264.17	337.19	110.40	73.02	-37.37	0.0112	4240.24
June	13	0.23	242.45	337.19	110.40	94.73	-15.66	0.0112	4222.18
June	14	0.23	236.11	337.19	110.40	101.08	-9.32	0.0112	4210.47
June	15	0.20	204.77	337.19	110.40	132.42	22.02	0.0112	4230.10
June	16	0.24	245.57	337.19	110.40	91.62	-18.78	0.0112	4208.93
June	17	0.20	206.94	337.19	110.40	130.25	19.85	0.0112	4226.39
June	18	0.22	230.82	337.19	110.40	106.37	-4.02	0.0112	4219.98
June	19	0.23	244.35	337.19	110.40	92.84	-17.55	0.0112	4200.03
June	20	0.31	320.59	337.19	110.40	16.60	-93.79	0.0112	4103.85
June	21	0.28	296.24	337.19	110.40	40.95	-69.45	0.0112	4032.01
June	22	0.33	345.31	337.19	110.40	(8.12)	-118.52	0.0112	3911.10
June	23	0.26	274.50	337.19	110.40	62.69	-47.71	0.0112	3861.00
June	24	0.28	291.70	337.19	110.40	45.49	-64.91	0.0112	3793.71
June	25	0.23	244.88	337.19	110.40	92.31	-18.09	0.0112	3773.23
June	26	0.25	257.49	337.19	110.40	79.70	-30.69	0.0112	3740.14
June	27	0.30	310.72	337.19	110.40	26.47	-83.93	0.0112	3653.82
June	28	0.30	308.26	337.19	110.40	28.93	-81.46	0.0112	3569.97
June	29	0.26	273.50	337.19	110.40	63.69	-46.70	0.0112	3520.87
June	30	0.26	276.49	337.19	110.40	60.70	-49.70	0.0112	3468.79
July	1	0.30	313.27	337.19	106.84	23.92	-82.91	0.0116	3383.40
July	2	0.30	316.38	337.19	106.84	20.81	-86.02	0.0116	3294.90
July	3	0.26	271.77	337.19	106.84	65.42	-41.42	0.0116	3251.01
July	4	0.25	257.56	337.19	106.84	79.62	-27.21	0.0116	3221.32

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year (does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	5	0.31	323.33	337.19	106.84	13.86	-92.97	0.0116	3125.87
July	6	0.31	326.61	337.19	106.84	10.58	-96.26	0.0116	3027.14
July	7	0.25	261.95	337.19	106.84	75.24	-31.60	0.0116	2993.07
July	8	0.32	328.81	337.19	106.84	8.38	-98.45	0.0116	2892.14
July	9	0.27	277.29	337.19	106.84	59.90	-46.94	0.0116	2842.73
July	10	0.33	341.96	337.19	106.84	(4.77)	-111.60	0.0116	2728.65
July	11	0.33	343.05	337.19	106.84	(5.87)	-112.70	0.0116	2613.48
July	12	0.30	314.56	337.19	106.84	22.63	-84.20	0.0116	2526.80
July	13	0.30	312.37	337.19	106.84	24.82	-82.01	0.0116	2442.31
July	14	0.34	359.49	337.19	106.84	(22.31)	-129.14	0.0116	2310.70
July	15	0.26	275.10	337.19	106.84	62.09	-44.75	0.0116	2263.48
July	16	0.24	253.18	337.19	106.84	84.01	-22.83	0.0116	2238.18
July	17	0.25	258.66	337.19	106.84	78.53	-28.31	0.0116	2207.39
July	18	0.26	267.43	337.19	106.84	69.76	-37.08	0.0116	2167.84
July	19	0.29	304.69	337.19	106.84	32.50	-74.34	0.0116	2091.03
July	20	0.31	324.42	337.19	106.84	12.77	-94.07	0.0116	1994.49
July	21	0.28	295.93	337.19	106.84	41.26	-65.57	0.0116	1926.44
July	22	0.25	265.24	337.19	106.84	71.95	-34.88	0.0116	1889.09
July	23	0.30	310.17	337.19	106.84	27.02	-79.82	0.0116	1806.79
July	24	0.27	286.06	337.19	106.84	51.13	-55.71	0.0116	1748.61
July	25	0.31	320.04	337.19	106.84	17.15	-89.68	0.0116	1656.45
July	26	0.31	325.52	337.19	106.84	11.67	-95.16	0.0116	1558.81
July	27	0.36	372.65	337.19	106.84	(35.46)	-142.29	0.0116	1414.05
July	28	0.33	344.15	337.19	106.84	(6.96)	-113.80	0.0116	1297.77

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
July	29	0.30	312.37	337.19	106.84	24.82	-82.01	0.0116	1213.29
July	30	0.30	314.56	337.19	106.84	22.63	-84.20	0.0116	1126.61
July	31	0.29	299.21	337.19	106.84	37.98	-68.86	0.0116	1055.28
August	1	0.31	320.04	337.19	106.84	17.15	-89.68	0.0091	963.65
August	2	0.29	305.79	337.19	106.84	31.40	-75.44	0.0091	886.28
August	3	0.29	302.50	337.19	106.84	34.69	-72.15	0.0091	812.19
August	4	0.30	309.08	337.19	106.84	28.11	-78.72	0.0091	731.53
August	5	0.30	307.98	337.19	106.84	29.21	-77.63	0.0091	651.96
August	6	0.22	232.36	337.19	106.84	104.83	-2.00	0.0091	648.02
August	7	0.26	271.81	337.19	106.84	65.38	-41.46	0.0091	604.62
August	8	0.29	302.15	337.19	106.84	35.04	-71.80	0.0091	530.89
August	9	0.26	276.04	337.19	106.84	61.15	-45.69	0.0091	483.26
August	10	0.28	292.75	337.19	106.84	44.43	-62.40	0.0091	418.92
August	11	0.26	271.62	337.19	106.84	65.57	-41.26	0.0091	375.72
August	12	0.30	313.36	337.19	106.84	23.83	-83.00	0.0091	290.77
August	13	0.30	308.20	337.19	106.84	28.99	-77.85	0.0091	210.99
August	14	0.28	289.65	337.19	106.84	47.54	-59.30	0.0091	149.75
August	15	0.23	235.84	337.19	106.84	101.35	-5.49	0.0091	142.32
August	16	0.28	289.66	337.19	106.84	47.53	-59.31	0.0091	81.08
August	17	0.25	257.17	337.19	106.84	80.02	-26.82	0.0091	52.32
August	18	0.23	242.89	337.19	106.84	94.30	-12.53	0.0091	37.85
August	19	0.24	247.35	337.19	106.84	89.84	-16.99	0.0091	18.91
August	20	0.23	239.01	337.19	106.84	98.18	-8.66	0.0091	8.32
August	21	0.23	235.30	337.19	106.84	101.88	-4.95	0.0091	1.43

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day

NGWSP diversion = 33119 acre feet per year (does not include east lateral)

Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS

Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)

down stream acreage = 8455 acres found in ref 1.

crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.

Storage size

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
August	22	0.21	222.05	337.19	106.84	115.14	8.31	0.0091	7.79
August	23	0.19	202.37	337.19	106.84	134.82	27.98	0.0091	33.83
August	24	0.19	201.85	337.19	106.84	135.34	28.50	0.0091	60.40
August	25	0.15	157.75	337.19	106.84	179.44	72.60	0.0091	131.06
August	26	0.16	166.87	337.19	106.84	170.32	63.48	0.0091	192.61
August	27	0.18	185.78	337.19	106.84	151.41	44.58	0.0091	235.25
August	28	0.18	184.13	337.19	106.84	153.06	46.22	0.0091	279.53
August	29	0.16	168.59	337.19	106.84	168.60	61.76	0.0091	339.35
August	30	0.17	172.54	337.19	106.84	164.64	57.81	0.0091	395.22
August	31	0.18	187.42	337.19	106.84	149.77	42.93	0.0091	436.22
September	1	0.14	142.05	337.19	110.40	195.14	84.74	0.0075	519.35
September	2	0.15	153.57	337.19	110.40	183.62	73.22	0.0075	590.96
September	3	0.14	149.98	337.19	110.40	187.20	76.81	0.0075	666.16
September	4	0.13	137.07	337.19	110.40	200.12	89.72	0.0075	754.28
September	5	0.12	125.52	337.19	110.40	211.67	101.27	0.0075	853.95
September	6	0.12	130.27	337.19	110.40	206.92	96.52	0.0075	948.86
September	7	0.13	130.95	337.19	110.40	206.24	95.84	0.0075	1043.10
September	8	0.11	117.38	337.19	110.40	219.81	109.41	0.0075	1150.90
September	9	0.13	135.70	337.19	110.40	201.49	91.09	0.0075	1240.39
September	10	0.13	135.02	337.19	110.40	202.17	91.77	0.0075	1330.56
September	11	0.15	151.98	337.19	110.40	185.21	74.81	0.0075	1403.76
September	12	0.13	136.38	337.19	110.40	200.81	90.42	0.0075	1492.57
September	13	0.11	111.27	337.19	110.40	225.92	115.52	0.0075	1606.48
September	14	0.12	129.59	337.19	110.40	207.60	97.20	0.0075	1702.08

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
 NGWSP diversion = 33119 acre feet per year(does not include east lateral)  
 Reservoir Inflow capacity = [REDACTED] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [REDACTED] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [REDACTED] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [REDACTED]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
September	15	0.10	107.88	337.19	110.40	229.31	118.91	0.0075	1819.38
September	16	0.12	128.91	337.19	110.40	208.28	97.88	0.0075	1915.65
September	17	0.13	139.77	337.19	110.40	197.42	87.02	0.0075	2001.07
September	18	0.14	143.84	337.19	110.40	193.35	82.95	0.0075	2082.42
September	19	0.14	141.80	337.19	110.40	195.38	84.99	0.0075	2165.80
September	20	0.14	141.13	337.19	110.40	196.06	85.67	0.0075	2249.86
September	21	0.14	151.30	337.19	110.40	185.89	75.49	0.0075	2323.74
September	22	0.14	141.13	337.19	110.40	196.06	85.67	0.0075	2407.80
September	23	0.13	136.38	337.19	110.40	200.81	90.42	0.0075	2496.61
September	24	0.14	145.20	337.19	110.40	191.99	81.60	0.0075	2576.60
September	25	0.09	96.35	337.19	110.40	240.84	130.45	0.0075	2705.44
September	26	0.12	126.88	337.19	110.40	210.31	99.91	0.0075	2803.74
September	27	0.16	162.84	337.19	110.40	174.35	63.96	0.0075	2866.09
September	28	0.14	148.59	337.19	110.40	188.60	78.20	0.0075	2942.69
September	29	0.17	178.44	337.19	110.40	158.75	48.35	0.0075	2989.43
September	30	0.13	137.05	337.19	110.40	200.13	89.74	0.0075	3077.56
October	1	0.10	99.74	337.19	85.47	237.45	151.98	0.0044	3228.60
October	2	0.10	106.52	337.19	85.47	230.67	145.20	0.0044	3372.86
October	3	0.11	113.31	337.19	85.47	223.88	138.41	0.0044	3510.33
October	4	0.10	105.84	337.19	85.47	231.34	145.88	0.0044	3655.27
October	5	0.12	122.13	337.19	85.47	215.06	129.59	0.0044	3783.92
October	6	0.12	121.45	337.19	85.47	215.74	130.27	0.0044	3913.26
October	7	0.13	134.34	337.19	85.47	202.85	117.38	0.0044	4029.70
October	8	0.13	140.45	337.19	85.47	196.74	111.27	0.0044	4140.03

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity = 337.18871 acre feet per day  
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 Reservoir Inflow capacity = [redacted] acre feet/day through Coury Lateral, Max 170 CFS  
 Assumed operation efficiency = [redacted] conveyance efficiency (90 % efficiency found in ref 1.)  
 down stream acreage = 8455 acres found in ref 1.  
 crop application efficiency = [redacted] NIIP irrigation efficiency of 75% found in ref. 1.  
 Storage size [redacted]

Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
October	9	0.13	135.02	337.19	85.47	202.17	116.70	0.0044	4255.79
October	10	0.12	121.45	337.19	85.47	215.74	130.27	0.0044	4280.00
October	11	0.06	64.46	337.19	85.47	272.73	187.26	0.0044	4280.00
October	12	0.09	97.70	337.19	85.47	239.49	154.02	0.0044	4280.00
October	13	0.10	103.81	337.19	85.47	233.38	147.91	0.0044	4280.00
October	14	0.11	112.63	337.19	85.47	224.56	139.09	0.0044	4280.00
		0.05			33119				
		0.05							

Navajo Gallup Water Supply Project  
 NIIP Amarillo Alternative winter operations  
 Year 2040

Amarillo Canal Capacity 337.18871 acre feet per day  
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Month	Day	Evap Trans average inches	NIIP demand acre feet	NIIP Canal availability w/efficiency	NGWSP demand acre feet	NIIP surplus acre feet	Available for Storage Req. acre feet	Evaporation loss feet	Cummulative storage acre feet
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- Notes:
1. Evap Trans = Peak EvaporTranspiration for an average 10 day period for year 2000. Data from Keller- Bleisner Engineering
  2. NIIP demand = Niip water demand based on downstream acreage, evapotranspiration, conveyance and irrigation efficiency  
 (NIIP demand =  $ET \times \text{downstream acreage} / \text{conveyance efficiency} / \text{irrigation efficiency}$ )
  3. NIIP Canal availability = Design flowrate for system at the point of diversion
  4. NGWSP demand = Daily demand distribution of the yearly demand ref. 4.
  5. NIIP surplus = Water available after NIIP demand is met. (NIIP surplus = NIIP Canal availability - NIIP demand).
  6. Available for storage = Excess water available after meeting NIIP and NGWSP needs
  7. Evaporation loss = average evaporation loss based on Navajo Reservoir evaporation.
  8. Cummulative storage = Storage of current day including inflow, outflow and losses.
- There are no losses assumed for conveyance from Navajo Dam through NIIP system assessed to NGWSP because NIIP's current operations reflect total losses and additional water would not increase existing losses (i.e. NIIP operates at full canal level).

- Reference:
1. "Navajo Indian Irrigation Project, Gallegos Needs and Cost Assessment", May 1995, Keller-Bleisner Engineering
  2. "Technical Memorandum No. GG-8311-2, "Gallegos Dam, Reconnaissance Design Summary", February 1995, Technical Service Center, Bureau of Reclamation
  3. Navajo Nation Department of Water Resources.
  4. Navajo Tribal Utility Authority memorandum.

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix E.2**

**NIIP Amarillo Alternative  
O&M Costs  
Year 2020 and 2040**

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Amarillo Alternative Year 2020  
 October 17, 2001

Estimated Present Cost Index= 3.00  
 based on 1977 = 1.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP Cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$3,320.45
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	\$7,835.93
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	\$2,908.05
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	\$2,745.41
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	\$1,598.03
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	\$516.25
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	\$5,720.60
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	\$1,935.78
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	\$8.44
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	\$794.93
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	\$3,653.57
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	\$3,835.75
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	\$3,210.01
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
					Total	\$38,083

NOTES:

Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 43cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT  
 ESTIMATED OPERATIONS AND MAINTENANCE COST FOR NIIP CANAL SYSTEM  
 NIIP Amarillo Alternative Year 2040  
 October 17, 2001

Estimated Present Cost Index=  
 based on 1977 = 1.00 3.00

CANAL	REACH	CAPACITY (cfs)	LENGTH (miles)	O&M RATE (1986 \$/mile)	O&M COST (Index 2001 \$)	NGWSP Cost
Main	Tunnel 1	1800	1.9087	\$12,000.00	\$34,880.02	
Main	Flume	1800	0.0936	\$12,000.00	\$1,709.74	
Main	Gobernador Siphon	1800	0.2390	\$12,000.00	\$4,367.79	
Main	Lined Canal Sec. 1	1800	0.1362	\$12,000.00	\$2,488.46	
Main	Tunnel 2	1800	4.8902	\$12,000.00	\$89,363.17	
Main	Unlined Sec.	1800	0.6250	\$6,500.00	\$6,186.55	\$5,173.73
Main	8.9 Siphon	1800	0.4150	\$12,000.00	\$7,583.06	
Main	Lined Canal Sec. 1	1800	1.3021	\$12,000.00	\$23,794.42	
Main	Largo Siphon	1800	1.5591	\$12,000.00	\$28,491.00	
Main	Lined Canal Sec. 1	1800	1.3928	\$12,000.00	\$25,452.24	
Main	Tunnel 3	1800	2.9275	\$12,000.00	\$53,496.77	
Main	Lined Canal Sec. 1	1800	0.1945	\$12,000.00	\$3,554.45	
Main	16.7 Siphon	1800	0.0400	\$12,000.00	\$730.27	
Main	Lined Canal Sec. 1	1800	1.0587	\$12,000.00	\$19,347.02	
Main	17.9 Siphon	1800	0.0436	\$12,000.00	\$796.03	
Main	Lined Canal Sec. 1	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Tunnel 3A	1800	0.6483	\$12,000.00	\$11,847.02	
Main	Lined Canal Sec. 1	1800	0.9138	\$12,000.00	\$16,699.35	
Main	Armenta Siphon	1800	0.7042	\$12,000.00	\$12,868.02	
Main	Lined Canal Sec. 1	1800	2.2367	\$12,000.00	\$40,874.48	
Main	Tunnel 4	1800	0.9489	\$12,000.00	\$17,339.64	
Main	Lined Canal Sec. 1	1800	2.3513	\$12,000.00	\$42,968.39	
Main	Kutz Siphon	1800	1.1127	\$12,000.00	\$20,333.41	
Main	Lined Canal Sec. 1	1800	1.8142	\$12,000.00	\$33,152.98	\$12,372.52
Main	W. Kutz Siphon	1625	0.6756	\$11,800.00	\$12,139.65	
Main	Lined Canal Sec. 2	1625	0.6402	\$11,800.00	\$11,503.23	
Main	Hwy 44 Tunnel	1625	0.1068	\$11,800.00	\$1,919.47	
Main	Lined Canal Sec. 2	1625	0.5428	\$11,800.00	\$9,753.92	
Main	Horn Siphon	1625	0.4903	\$11,800.00	\$8,811.20	
Main	Lined Canal Sec. 2	1625	4.4648	\$11,800.00	\$80,229.93	\$4,591.66
Main	Lined Canal Sec. 3	1500	6.0824	\$11,700.00	\$108,371.45	\$4,334.86
Main	E. Gallegos Siphon	1355	1.0716	\$11,300.00	\$18,440.07	
Main	Lined Canal Sec. 4	1355	2.2398	\$11,300.00	\$38,542.28	\$2,523.20
Main	W. Gallegos Siphon	1285	0.3470	\$11,100.00	\$5,865.02	
Main	Lined Canal Sec. 5	1285	0.0047	\$11,100.00	\$80.04	
Gravity Main	Lined Canal Sec. 1	1285	0.6811	\$11,100.00	\$11,512.34	\$815.13
Gravity Main	Lined Canal Sec. 2	670	5.4629	\$9,100.00	\$75,703.85	
Gravity Main	Hwy 371 Siphon	670	0.0631	\$9,100.00	\$873.99	
Gravity Main	Lined Canal Sec. 2	670	1.7525	\$9,100.00	\$24,285.39	\$9,032.53
Gravity Main	Tunnel 5	610	1.4085	\$8,700.00	\$18,661.14	
Gravity Main	Lined Canal Sec. 3	610	0.9369	\$8,700.00	\$12,413.16	\$3,056.49
Gravity Main	Lined Canal Sec. 4	225	1.9996	\$4,000.00	\$12,180.43	
Gravity Main	Rd. 4060 Siphon	225	0.1326	\$4,000.00	\$807.57	
Gravity Main	Lined Canal Sec. 4	225	1.7504	\$4,000.00	\$10,662.21	
Gravity Main	Hwy 3003 Siphon	225	0.0720	\$4,000.00	\$438.39	
Gravity Main	Lined Canal Sec. 4	225	0.6807	\$4,000.00	\$4,146.29	
Amarillo Canal	Lined Canal Sec. 1	610	0.0102	\$8,700.00	\$135.50	\$13.33
Amarillo Canal	Hwy 371 Siphon	390	0.0928	\$6,300.00	\$890.34	
Amarillo Canal	Lined Canal Sec. 2	390	0.7576	\$6,300.00	\$7,268.11	\$1,255.15
Amarillo Canal	Lined Canal Sec. 3	345	3.8214	\$5,700.00	\$33,170.54	\$5,768.79
Amarillo Canal	Lined Canal Sec. 4	190	2.9684	\$3,500.00	\$15,821.27	
Amarillo Canal	Lined Canal Sec. 4A	190	0.6299	\$3,500.00	\$3,357.46	\$6,056.44
Amarillo Canal	Lined Canal Sec. 5	170	2.5169	\$3,000.00	\$11,498.33	
Amarillo Canal	Lined Canal Sec. 5A	170	0.6265	\$3,000.00	\$2,862.25	\$5,068.44
Coury Lateral	Lined Canal Sec. 1	200	0.7898	\$3,600.00	\$4,329.72	
Coury Lateral	Hwy 44 Siphon	200	0.0947	\$3,600.00	\$519.15	
Coury Lateral	Lined Canal Sec. 2	200	3.2244	\$3,600.00	\$17,677.09	
Burnham Lateral	Reach 1	880	4.6000	\$10,000.00	\$70,050.76	
Burnham Lateral	Reach 2	425	9.3000	\$6,900.00	\$97,720.81	
Burnham Lateral West	All Sections	320	3.7000	\$5,300.00	\$29,862.94	
					Total	\$60,062

NOTES:  
 Bureau of Reclamation operation and maintenance costs and indexes  
 NGWSP costs are proportioned based on the maximum NGWSP flowrate of 67cfs and the canal capacity

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix E.3**

**NIIP Amarillo Alternative  
Winterization Costs**

**ESTIMATE WORKSHEET**

**FEATURE:**

28-Jan-02

**PROJECT:**

NAVAJO GALLUP WATER SUPPLY PROJECT

**NIP Amarillo Alternative  
Winterization Cost**

**DIVISION:**

NAVAJO GALLUP WATER SUPPLY PROJECT

**UNIT:**

H:\NGWSP\winterizationEST.123

PLANT ACCT.	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Winterize gates at headworks and Cutter Dam	223	2	STR	\$24,000.00	\$48,000.00
		Winterize gates at check structures	223	17	STR	\$24,000.00	\$408,000.00
		Winterize wasteway structure	223	4	STR	\$24,000.00	\$96,000.00
		Pump Plant Turnout sealing	223	43	EACH	\$1,200.00	\$51,600.00
						Subtotal	\$603,600.00
		Unlisted items 10%				Subtotal	\$663,960.00
		Contingencies 20%				Total	\$784,680.00
NOTE: Unlisted items include air compressor, strip heaters, electrical equipment, miscellaneous metal, and etc							

**QUANTITIES**

**PRICES**

BY  
Leon Baros

APPROVED

BY

CHECKED

DATE PREPARED

DATE

DATE

PRICE LEVEL

28-Jan-02

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix F**

**Technical Memorandum No. GG 8311-2  
GALLEGOS DAM  
Reconnaissance Design Summary  
1995**

**TECHNICAL SERVICE CENTER  
Denver, Colorado**

**Technical Memorandum No. GG-8311-2**

**GALLEGOS DAM  
Reconnaissance Design Summary**

*Prepared by*  
Betty Dinneen  
John Cyganiewicz  
Larry Bowman  
Cletus King  
Robert McGovern

U.S. Department of the Interior  
Bureau of Reclamation



February 16, 1995

## RECONNAISSANCE DESIGN SUMMARY Gallegos Dam

### I. INTRODUCTION

The proposed Gallegos Dam will be a feature of the Navajo Indian Irrigation Project (NIIP), a project that Reclamation has been constructing for the U.S. Bureau of Indian Affairs (BIA).

The proposed site for Gallegos Dam is located approximately 15 miles south of Farmington, New Mexico. The reservoir would be a temporary storage facility for irrigation water. The reservoir would be filled by pumping water from the Gravity Main Canal through the Gallegos Pumping Plant (under construction) into the Burnham Laterals (under construction) and then into Moncisco Wash upstream of the damsite. The water will be released from Gallegos Reservoir through the outlet works into the Service Canal. The Service Canal would then transport the water to Gallegos Pumping Plant to be distributed for irrigation.

Two damsites are being considered, the Gallegos Wash site and the Moncisco Wash site (figure 1.) The Gallegos Wash site is located on the West Fork of Gallegos Canyon approximately 1800 feet downstream of the confluence with Moncisco Wash. The Moncisco site is located on Moncisco Wash approximately 4200 feet upstream of the confluence with the West Fork of Gallegos Canyon.

A damsite in Gallegos Wash has been considered for many years. An appraisal grade design and cost estimate were completed in 1964. Between 1964 and 1991 the axis of the dam at this site was moved downstream approximately 500 feet due to the poor condition of the right abutment. Storage requirements for the reservoir also changed during this period. Final design grade geologic investigations were conducted at this site during 1991-1992. Due to the unexpected depth of the surficial soil materials at this site, as determined by these investigations, and the presence of productive gas wells and conveyance pipelines in the proposed reservoir area, the Moncisco Wash site was located as a potential alternative. This new site has not been geologically investigated except for reconnaissance grade visual investigations.

Following the location of the Moncisco site, the BIA requested Reclamation to develop new reconnaissance grade designs and cost estimates for both damsites. These estimates would then be used for planning purposes and for future discussion about dam location.

### II. REGIONAL TOPOGRAPHY AND GEOLOGY

#### A. Regional Geology

The damsites are located in the San Juan Basin of the Colorado Plateau Physiographic Province, an area characterized by young plateaus, mesas, cuestas, and dry-

wash canyons. The San Juan Basin is a broad, synclinal basin in northwestern New Mexico and southwestern Colorado. The basin contains sedimentary rocks that range from Cambrian to Holocene in age and are as much as 15,000 feet thick. The deeper part of the basin, the Central Basin, is bounded on all, but the south side by a prominent feature known as the "Hogback Monocline."

The rock outcrops found in the Central Basin consist of Tertiary age and Upper Cretaceous age rock formations. The Nacimiento Formation (Tn), Ojo Alamo Formation (Toa), and Kirtland Shale Formation (Kk) underlie most of the project area and consist predominantly of sandstone, shale, siltstone, and conglomerate which were deposited in coastal lowlands and shallow marine environments. These formations are essentially flat lying, having low regional dips of 1° to 2° westerly or easterly depending on the area of the basin.

#### B. Site Geology

The area of the proposed dams and reservoir sites is generally rolling to gently sloping with deeply incised, steep sided, flat bottomed, washes and gullies. The washes flow intermittently, only during and shortly after times of precipitation.

The data referred to herein is from the Gallegos Damsite "Geologic Design Data Report" [1]. Specific site geology data has not been collected for the Moncisco Wash damsite. For the purpose of this study, assumptions were made that the conditions are similar at both sites and that the data collected at the Gallegos site can be utilized for this study at both sites. However, a site specific data collection program for Moncisco Wash damsite should be conducted should higher grade design studies be required.

#### C. Surficial Deposits

Much of the project area is blanketed by deposits of surficial materials (alluvium, colluvium, and eolian) of Quaternary age which vary from inches to over 60 feet in thickness with an average thickness of about 20 to 25 feet (see the Gallegos Damsite - Top of Competent Bedrock drawing). The eolian materials (dune sand) range from inches to over 20 feet in thickness with the alluvium ranging from inches to over 60 feet in thickness and the colluvium ranging from inches to over 10 feet in thickness.

These surficial deposits consist mostly of silty, fine to medium sand, with minor amounts of fine quartzose gravel disseminated throughout. The predominant material is dune sand with minor alluvial deposits and slopewash.

Subordinate interbeds of clayey sand, poorly graded sand, poorly graded sand with gravel, or silty gravel were noted. Reaction with dilute hydrochloric acid (HCl) ranges from none to strong. The surficial deposits are loose to compact, unconsolidated, and uncemented.

All of the surficial materials, except the clays, are moderately to highly permeable and are highly erodible. The SPT N-value data collected at the Gallegos damsite in these surficial materials in 1991-92 ranged from 5 to over 50 blows per foot (DH91-5 and DH91-17, respectively), but averaged in the low teens which indicate the presence of low density material.

#### D. Bedrock

Bedrock at the sites is interbedded layers and lenses of sandstone, shale, and siltstone. It is typically poorly to moderately cemented, soft to moderately hard and often exhibits soil-like characteristics. Bedrock is exposed only at the right abutment at the Gallegos damsite, whereas at the Moncisco Wash damsite, bedrock is exposed in both abutments.

Only one geologic formation, the Ojo Alamo Formation, is exposed at the damsites. The overlying Nacimiento Formation has been eroded away at the sites, but is exposed to the east and west. The Kirtland Shale Formation is not exposed in the area, but was encountered at depth in drill holes at Site 1 (the Gallegos Wash site). There has been no exploration at site 2 (the Moncisco Wash site). The following is a brief description of the geologic units occurring in the vicinity of the damsites.

##### 1. Nacimiento Formation (Tn)

Generally composed of interbedded coarse to fine grained sandstone, siltstone, and shale. The weathered bedrock is difficult to distinguish from the overlying surficial materials.

Commonly the sandstones are soft to moderately hard, friable, and poorly cemented. The sandstone weathers to a sandy material with varying amounts of silt and clay.

The shales are soft to moderately hard. They are compacted silt and clay and readily air slake. Upon weathering the shales become silts and clays. The shale is known to exhibit swelling characteristics.

## 2. Ojo Alamo Formation (Toa)

This formation is the foundation bedrock for the damsites and appurtenant structures. For purposes of this report, the formation has been separated into six (6) units as follows:

(a) SS<sub>1</sub>: This is the upper most unit of the formation at the Gallegos damsite (Site 1). It consists principally of conglomeratic sandstone with varying amounts of pebble-sized gravel. This unit is separated from the SS<sub>2</sub> unit on the basis of having a much higher percent of gravel. The gravel occurs in layers and lenses, and varies both laterally and vertically in short distances. The SS<sub>1</sub> unit is estimated to contain over 50 percent pebble size (1/4 inch to 3 inch), rounded, very hard, and dense quartzite and chert gravel. It varies from very poorly cemented to moderately cemented. Some lenses are clean, contain little sand and are permeable. Other lenses contain sand and are not significantly permeable. Overall, the unit is poorly to moderately cemented, friable, soft to moderately hard, weathered and variably exhibits soil-like (gravel) to rock like characteristics.

There are silicified wood (petrified wood) logs and fragments throughout this unit which vary from fragments to over 12 inches in diameter and up to 10 to 15 feet long.

(b) SS<sub>2</sub>: This unit also contains the pebble-size gravel lenses, but the lenses are smaller and make up a lesser percentage of the formation. This unit is primarily a medium grained, friable, poor to moderately cemented, soft to moderately hard, somewhat argillaceous, conglomeratic, quartzose sandstone. The unit is generally massive but contains some shale seams and lenses.

Fragments of petrified wood also occur throughout this unit, but principally in the upper part. They can be seen on the ground surface on the right abutment (Gallegos damsite), They vary from small fragments to 12 inches in diameter and 10 to 15 feet long.

(c) Sh<sub>1</sub>: This unit is composed of an upper shale layer and a lower siltstone layer. The unit varies in thickness, but combined, averages about

12 feet in drill holes. The shale is dark gray, soft, well compacted silty clay shale. It weathers to a moderate to high plasticity clay. It air slakes quickly upon exposure and displays swelling characteristics. The siltstone is dark gray, soft, well compacted, displays little to poor cementation, has shale seams and some highly argillaceous sandstone layers. It weathers to a clayey soil. It air slakes upon exposure and some indications of swelling were noted.

(d) SS<sub>3</sub>: This unit is a thin sandstone layer identified only on the right abutment of Gallegos damsite. It varies from 15 to 25 feet in thickness, and is overlain by shale unit Sh<sub>1</sub> and overlies shale unit Sh<sub>2</sub>. The unit is principally a fine grained, silty, friable, poorly to moderately cemented, moderately hard, argillaceous (in part) sandstone. There are thin shale layers and sandy siltstone layers throughout the unit.

(e) Sh<sub>2</sub>: This unit was identified only on the right abutment of Gallegos damsite in drill holes. It varies in composition from a gray clay shale to friable fine-grained sandstone. The materials are lensed and layered and change quickly both laterally and vertically. The unit however, is predominately shale, siltstone and shaley sandstone. Shales and siltstones are well compacted with little cementation, soft and gouge quite easily. They air slake quickly on exposure and appear to have swelling characteristics. The sandstones are friable and poorly to moderately cemented.

(f) SS<sub>4</sub>: At the Gallegos damsite this unit is not exposed but underlies the dam from Station 13+50 to about Station 36+50. It varies from about 20 to 50 feet in thickness in the dam foundation. The unit is principally a fine grained, silty, soft, poorly cemented, friable sandstone. It is easily broken and crumbles with a moderate hammer blow. There are some thin gravelly lenses, and some shaley siltstone layers throughout. This unit is underlain by the Kirtland Shale Formation.

### 3. Kirtland Shale Formation (Kk)

The Kirtland is not exposed at the damsites. It was encountered at depth in the drill holes at Site 1 (Gallegos Wash) and at the Gallegos pumping plant site

which is located approximately 1 mile downstream. The Kirtland is composed primarily of interbedded, fine grained, silty, friable, gray sandstones, gray claystones, and soft, gray, silty, clay shale. The shales are somewhat carbonaceous and some pyrite was noted. The shales are dominant. Natural gas was noted in small amounts in some of the drill holes the penetrated the formation.

#### E. Weathering

Weathering of the bedrock is fairly deep (5 to 20 feet) because of the low water table conditions and dryness of the area. However, weathering within the bedrock is difficult to define because of the natural softness, poor cementing, general composition of the bedrock, and the layering of the formations. Except for the upper several feet of the rock, weathering has not generally effected the strength or physical condition of the bedrock. In some areas, bedrock was soft enough to drill with the Hollow Stem Auger system used for exploration.

#### F. Groundwater

The area of the damsites is very dry, therefore groundwater in any large quantity is not present. Exploration at Site 1 (Gallegos Wash) indicates that there is limited groundwater present in the surficial material along the larger drainages and that the water table in the abutments is much deeper; water levels ranged from 2.4 feet in TP91-2 to 82.6 feet in DH-18B (water level data is from 91-92 exploration). Some of the sandstone beds in the Ojo Alamo Formation are porous and contain little silt and clay. These beds will transmit some water.

Permeability testing at the Gallegos damsite (Site 1) has shown the bedrock to be fairly tight. Water losses that did occur were along bedding planes or within conglomerate or sandstone beds (Ojo Alamo Formation). Permeability values ranged from 0 to a maximum of 1229 feet/year with even higher losses in the 1964 drill holes. Most permeability values are less than 100 feet/year. The high permeability values are believed to be leakage around the packers, as in each case where high losses occurred, the hole was very rough, caving, or the test interval was near the bedrock surface. Overall, permeability of the bedrock is low.

There is some primary permeability in the conglomerate and a few of the sandstone beds (Ojo Alamo Formation). This is low, but perhaps is higher overall than the secondary permeability. In the right abutment at Gallegos damsite (Site 1) some seepage occurs along the contact of the

sandstone (SS<sub>2</sub>) and the underlying shale (Sh<sub>1</sub>). This would indicate that the sandstone unit is permeable and that the shale is impermeable, forming a barrier to downward percolation.

Because of the overall softness of the bedrock, lack of open jointing and bedding planes, and the low permeability, it is expected that grouting of the bedrock will be difficult and grout takes will be low and probably not very effective. However, it is felt that part (perhaps up to 20 feet) of the bedrock, particularly the left abutment and channel areas of the Gallegos Wash damsite might require some type of cutoff.

Permeability of the Kirtland Formation is very low.

#### G. Seismotectonics

The Bureau of Reclamation seismotectonic studies in the area include those for Cutter Dam (Weisenberg, 1988); Navajo Dam, 15 miles north of Cutter Dam (Foley and La Forge, 1983); El Vado and Heron Dams (Reclamation, 1986); Santa Cruz Dam (La Forge and Anderson, 1988), located 81 miles and 149 miles, respectively, east of the project; and the Navajo Regional Seismotectonic Study [6], which encompasses the broad northeastern Arizona and northwestern New Mexico area. Data and conclusions from these studies, including maximum credible earthquakes (MCE), are considered suitable and adequate for reconnaissance design but not for final design. Estimated maximum credible earthquakes for Cutter Dam [6] are shown in table 1.

For Cutter Dam in northwestern New Mexico, several faults should be considered potential seismic sources in addition to the random earthquake [6]. These faults are either in the Rio Grande rift or in the transition zone between the rift and the Colorado Plateau. These fault sources should be considered for Cutter Dam despite their distance of >50 km from the dam because the sizes of the earthquakes that may be generated could produce low intensity, but long duration, shaking at the site.

Table 1. Estimated Maximum Credible Earthquakes for Seismic Sources for Cutter Dam, Northwest New Mexico.

SEISMIC SOURCE	DISTANCE FROM CUTTER DAM <sup>1)</sup> (km)	MCE (M <sub>s</sub> )	ESTIMATED DEPTH (km)
Random Earthquake	12	6 (M <sub>1</sub> )	7
Dulce Area	70 <sup>2)</sup> 155 <sup>2)</sup>	6-1/4 7-1/2	7-15 7-15
Pajarito	170 <sup>2)</sup>	7 to 7-1/2	7-15
Embudo			

<sup>1)</sup> This is the closest approach of the mapped surface trace of the fault sources.

<sup>2)</sup> Distance to Navajo Indian Irrigation Project-Gallegos Dam site is approximately 50 kilometers further.

No evidence of surface faulting has been identified in the project area; therefore, surface faulting beneath the planned project features is not a hazard.

No geologic hazards, except potential seismic hazards, are known to exist in the project area.

#### F. Accessibility

Gallegos Dam Reservoir is located about 15 miles south of Farmington, New Mexico. The project area is served by State Highway 371, which connects with U.S. Highway 550 at Farmington.

#### G. Gallegos Reservoir Sizing

To determine the size of the necessary reservoir at each site, allocations for dead storage, inactive storage, and active storage were determined for each of the reservoir sites. The size of the reservoirs would, therefore, be the sum of these allocations. In converting reservoir volume to an elevation where applicable, reservoir storage data was used to determine elevations (rounded up to an even foot).

A discussion of each allocation and the final storage requirements for each site are as follows:

(a) Allocation for Dead Pool

The elevation of the low-level outlet works is required to be set at approximately the elevation of outlet canal to allow for releases. Water below the elevation of the outlet works is, therefore, inaccessible and therefor considered 'dead'. For the Gallegos Wash site the dead pool was set about 2 feet above the water level in the outlet canal. The dead pool level (invert of the outlet works) was, therefore, set at elevation 5910 (489 acre-feet.)

For the Moncisco Wash site the outlet works was set at about the same height above stream level as the Gallegos Wash outlet works. This resulted in a dead pool elevation of 5969 feet (285 acre-feet.)

b. Allocation for Inactive pool

The inactive pool at each dam was based on the water surface required to pass 260 ft<sup>3</sup>/s through the outlet works. Assuming this requirement applies to the full range of reservoir operating elevation, this then necessitates a minimum hydraulic head at the outlet works to maintain this flow at the lowest reservoir elevation. Applying this required hydraulic head to the dead pool level results in the following Top of Inactive Conservation elevation:

GALLEGOS WASH SITE		MONCISCO WASH SITE	
Elevation 5923	2,237 acre-feet	Elevation 5982	1,603 acre-feet

c. Allocation for Active Storage Conservation:

The required operational storage for Gallegos Reservoir has been presently set at 7735 acre-feet of storage. The Active Storage allocation can then be determined by adding this operational storage to the estimated 100 year sediment load, the estimated yearly evaporation loss, and the estimated yearly seepage loss.

The estimates for evaporation and seepage loss were obtained from the 1964 reconnaissance design and were still considered applicable for this study. The estimates for the 100 year sediment load were taken from previous studies [3].

	GALLEGOS WASH SITE	MONCISCO WASH SITE
Required Operational Storage	7735 acre-ft	7735 acre-ft
100 Year Sediment	3850 acre-ft <i>5.7%</i>	1800 acre-ft <i>2.9%</i>
Evaporation Loss	450 acre-ft <i>5.8%</i>	450 acre-ft <i>5.8%</i>
Seepage Loss	270 acre-ft <i>3.5%</i>	270 acre-ft <i>3.5%</i>
Total Active Storage	12,305 acre-ft	10,255 acre-ft

The necessary sizes and the corresponding elevations of the Top of Active Conservation for the reservoirs is the sum of these allocations as follows:

	GALLEGOS WASH SITE	MONCISCO WASH SITE
Dead Pool Storage	489 acre-ft	285 acre-ft
Inactive Storage	2,237 acre-ft	1,603 acre-ft
Total Active Storage	12,305 acre-ft	10,255 acre-ft
Total *	14,542 acre-ft	11,858 acre-ft
Corresponding Elevation Top of Active (ft)	5962	6024

\* Total based on top of active rounded to nearest foot. As a comparison, the 1964 Reconnaissance Design proposed a storage capacity of 54,000 acre-feet.

#### Design Floods

The necessary size and the corresponding elevation of the Top of PMF (probable maximum flood) studies were performed for the dam sites [4]. The PMFs developed for each site are as follows:

GALLEGOS WASH SITE	PEAK INFLOW (ft <sup>3</sup> /s)	VOLUME (acre-ft)	DURATION (hours)
Local Storm PMF	85,400	20,000	24 hours
September General PMF	17,500	15,900	86 hours
February General PMF	11,100	13,800	93 hours
MONCISCO WASH SITE	PEAK INFLOW (ft <sup>3</sup> /s)	VOLUME (acre-ft)	DURATION (hours)
Local Storm PMF	48,600	9,100	24 hours
September General PMF	9,400	6,700	72 hours
February General PMF	4,800	5,600	72 hours

In addition to the PMF study, 100- and 200-year flood hydrographs were also developed [5]:

GALLEGOS WASH SITE	PEAK INFLOW (ft <sup>3</sup> /s)	VOLUME (acre-ft)	DURATION (hours)
100-year Event	836	680	24 hours
200-year Event	990	820	24 hours
MONCISCO WASH SITE	PEAK INFLOW (ft <sup>3</sup> /s)	VOLUME (acre-ft)	DURATION (hours)
100-year Event	504	410	24 hours
200-year Event	597	495	24 hours

Based on the peak inflow and 24-hour volume, the Local Storm PMFs were determined to be the controlling PMFs and were used to size the spillways and set the crest elevations of the dams. The 100- and 200- year floods were not used in these reconnaissance designs other than to identify the feasibility of future conceptual designs for spillways which only operate when these floods are exceeded.

#### Selection of Dam Type

Any type of concrete dam was ruled out early in the design process based on inadequate foundation conditions. The rock at the site is not considered adequate for use as a rockfill. Therefore, a zoned earth embankment was selected for this design.

#### Construction Materials

During the investigation phase for the Gallegos site, a construction materials program was completed [2]. Four borrow areas were identified as potential sources of embankment materials.

Borrow areas "A" and "D" were located immediately upstream of the Gallegos site in valley portions of the Moncisco Wash and the West Fork Wash, respectively. Soil materials contained in these borrow areas are similar and are also representative of the surficial materials at the damsites. The materials are generally non-plastic silty sands with some localized interbeds and pockets of sandy clays and clays. The average physical properties of the materials, as represented by a simple average of samples taken from test pits, are as follows:

	Sand & Gravel	Fines	Field Moisture
Borrow "A"	73 percent	27 percent	7 percent
Borrow "D"	65 percent	35 percent	13 percent

In an attempt to locate a borrow area containing consistent deposits of clayey materials, Borrow area "B" was located downstream of the Gallegos damsite on the western side slope of the wash. Preliminary investigations soon indicated that this borrow was unsuited for core material.

Borrow area "C" located about 5 to 6 miles upstream of the damsites, proved to contain predominantly clay materials with the following average physical properties:

	Sand & Gravel	Fines	Field Moisture
Borrow "C"	39 percent	61 percent	8 percent

Processed sand and gravel for filters, drains, and concrete aggregate would be obtained from commercial sources in Farmington, New Mexico.

Adequate quality rock for riprap is not available near the site and would have to be imported.

#### Embankment Design

Based on the available materials, an earth embankment constructed primarily from the silty sand materials appears to be well suited for the site. The lack of consistent materials with sufficient fines indicates that a different core material would be needed to provide the impermeable barrier to seepage.

To provide this core, two embankment options were studied. The first would be an embankment with a central earth core consisting of material from borrow area "C". While there appear to be sufficient quantities in borrow area "C", the long-haul distance from this borrow area dictated a second option for providing the water barrier be studied. This option would be an embankment with the impermeable barrier provided by a centrally located

cutoff wall. The cutoff wall would present difficult technical and construction problems and is not the preferred alternative. It is included in this study in case future investigations do not prove availability of desirable impervious earthfill material for construction of the zone 1. Although not shown on the figures, the cutoff wall would be constructed 10 to 20 feet upstream of the zone 2 filter to prevent weakening and contamination of the filter zone. This wall would be a soil-bentonite wall and would be constructed in stages as the embankment is constructed from about mid-height of the embankment and the crest. These two alternative designs are shown on figures 2 and 3.

Due to the preliminary nature of these designs, a seismic analysis to determine the liquefaction potential of the surficial deposits was not performed. Due to the depositional history and low blow counts from SPT tests in some of these materials, the designs provided for complete removal of the surficial materials from beneath the dam to mitigate concerns over liquefaction. Consideration of in place densification techniques as a less costly alternative to complete removal were considered beyond the scope of these designs.

The foundation rock at the sites appears to be sufficiently impermeable to prevent excessive underseepage. While the rock mass generally will not accept standard cement grout, a grout curtain would still be necessary to seal any highly fractured areas, and is included.

The right abutment at the Gallegos Wash damsite is formed of nearly vertical sandstone underlain by shale. Excavation of this rock to stabilize, flatten and shape the abutment for placement of earthfill would be required. The Gallegos Wash site is shown on Figure 2 and the Moncisco Wash site is shown on Figure 3.

Testing of the potential construction materials followed by stability analyses were considered beyond the scope of work for these designs. Therefore, the slopes of the dam necessary to satisfy stability requirements were estimated from the descriptions of the materials. Embankment slopes of 3:1 upstream and 3:1 downstream (H:V) appear to be reasonable for the silty sands likely to be used to construct the embankments.

A 30-foot crest width was used for the embankment.

Zones of processed sand filter and gravel drain material were included in the designs to protect against piping of embankment and foundation material and to provide drainage of the embankment.

The silty sands at the site appear well suited for use in manufacturing soil cement and, therefore, this option was chosen to provide all slope protection in lieu of riprap. The designs

include a 10-foot horizontal width on the upstream face to protect against erosion from wave action and a 1-foot layer on the crest and downstream slope (measured perpendicular to the surface) for protection against erosion from wind and rain.

Based on the information discussed above, there does not appear to be the potential for strong seismic shaking at the site that would require extraordinary design considerations.

### Spillway Design

For each of the two sites two alternatives were studied to determine the optimum size of spillway and embankment. In all cases the embankment configuration described above was used in laying out the spillway configuration. Five feet of freeboard above the maximum water surface was used in all cases to set the crest elevation of the embankment.

#### Gallegos Wash Dam Site (Figure 2)

##### Alternative 1

Dam crest at elevation 5986  
Spillway crest at elevation 5962

The spillway is a reinforced concrete structure located on the dam embankment near the right abutment. The spillway was sized to pass the local storm PMF which has a peak inflow of 85,400 ft<sup>3</sup>/s and a 24 hour volume of 20,000 acre-feet. Routing of the PMF results in a maximum reservoir water surface elevation of 5981 feet and a maximum downstream discharge of 29,000 ft<sup>3</sup>/s.

The spillway has a 100-foot-wide uncontrolled ogee crest at normal water surface elevation 5962. Downstream of the crest structure, the chute maintains a relatively flat slope until it reaches the 3:1 downstream slope of the dam. The spillway maintains a constant width for its entire length. The 3:1 slope is maintained until the chute reaches the stilling basin invert at elevation 5854.5. The 97-foot-long, 100-foot-wide stilling basin is a standard USBR Type III stilling basin. The invert of the basin is about 30 feet below the ground surface. The channel downstream from the stilling basin is riprap lined and is sloped at 10:1 to bring the channel back to the ground surface.

##### Alternative 2

Dam crest at elevation 5983  
Spillway crest at elevation 5962

The spillway is a reinforced concrete structure located on the dam embankment near the right abutment. The spillway was sized to pass the local storm PMF which has a peak inflow of 85,400 ft<sup>3</sup>/s and a 24 hour volume of 20,000 acre-feet. Routing of the PMF results in a maximum reservoir water surface elevation of 5978 feet and a maximum downstream discharge of 44,000 ft<sup>3</sup>/s.

The spillway has a 200-foot-wide uncontrolled ogee crest at normal water surface elevation 5962. Downstream of the crest structure, the chute maintains a relatively flat slope until it reaches the 3:1 downstream slope of the dam. The spillway maintains a constant width for its entire length. The 3:1 slope is maintained until the chute reaches the stilling basin invert at elevation 5861.5. The 85-foot-long, 200-foot-wide stilling basin is a standard USBR Type III stilling basin. The invert of the basin is about 23 feet below the ground surface. The channel downstream from the stilling basin is riprap lined and is sloped at 10:1 to bring the channel back to the ground surface.

#### Moncisco Wash Dam Site (Figure 3)

##### Alternative 1

Dam crest at elevation 6040  
Spillway crest at elevation 6024

The spillway is a reinforced concrete structure located on the dam embankment near the right abutment. The spillway was sized to pass the local storm PMF which has a peak inflow of 48,600 ft<sup>3</sup>/s and a 24 hour volume of 9,100 acre-feet. Routing of the PMF results in a maximum reservoir water surface elevation of 6035 feet and a maximum downstream discharge of about 12,900 ft<sup>3</sup>/s.

The spillway has a 100-foot-wide uncontrolled ogee crest at normal water surface elevation 6024. Downstream of the crest structure, the chute maintains a relatively flat slope until it reaches the 3:1 downstream slope of the dam. The spillway width varies from 100 feet just downstream of the crest structure to 80 feet near the downstream end of the vertical curve at the start of the 3:1 slope. The 3:1 slope is maintained until the chute reaches the stilling basin invert at elevation 5932. The 70-foot-long, 80-foot-wide stilling basin is a standard USBR Type III stilling basin. The invert of the basin is about 13 feet below the ground surface. The channel downstream from the stilling basin is riprap lined and is sloped at 10:1 to bring the channel back to the ground surface.

## Alternative 2

Dam crest at elevation 6045  
No spillway

The dam was sized to store the entire local storm PMF which has a peak inflow of 48,600 ft<sup>3</sup>/s and a 24 hour volume of 9,100 acre-feet. The maximum water surface for the PMF is elevation 6040. Because the entire flood can be stored, a spillway is not required. However, a low area would be constructed off the right abutment of the embankment to prevent overflowing of the reservoir. The cost of this was considered negligible and was not specifically included in these designs.

### Outlet Works Design

The outlet works was assumed to be the same for each of the different dam and spillway alternatives at each of the dam sites. One outlet works was sized for each of the dam sites. The only difference between the outlet works required at the different dam sites was a minor difference in the lengths of the upstream and downstream conduits.

The outlet works is located in a cut-and-cover trench on the left abutment of the dam. The outlet works consists of a trashracked intake structure, a 66-inch-diameter upstream steel-lined conduit, a high-pressure slide gate located in a gate chamber near the center of the dam, a 66-inch steel downstream pipe located in a 10-foot-diameter horseshoe conduit, and a 60-inch jet-flow gate discharging into a impact type energy dissipator. Water exiting the energy dissipator enters the canal. A bulkhead for dewatering the upstream conduit was also included.

Access to the gate chamber is through the 10-foot horseshoe conduit. This access was selected to eliminate the need and cost of an access shaft from the crest of the dam.

### Service Canal Design

#### GALLEGOS WASH SITE

The Gallegos Service canal will convey 260 ft<sup>3</sup>/s from the Gallegos Wash Damsite to the Gravity Main Canal just downstream of the West Gallegos Siphon. The canal will be an unreinforced, concrete-lined trapezoidal section, with a depth of 6.22 feet and a total length of 5600 feet.

## MONCISCO WASH SITE

The Moncisco Service Canal will convey 260 ft<sup>3</sup>/s from the Moncisco Wash Damsite to the Gravity Main Canal just downstream of the West Gallegos Siphon. The canal will be an unreinforced concrete-lined trapezoidal section with a depth of 6.22 feet and a length of 11,000 feet. A drop structure will be constructed near the tie-in point to the Gravity Main canal.

The drop structure will be a reinforced, concrete-lined, rectangular chute 10 feet wide by 5 feet deep and 900 feet long with baffle blocks at the bottom.

### Cost Estimates

The combinations of embankment configuration and spillway size were summarized into four alternatives for each damsite. Cost estimates were prepared for each of these alternatives. Appendix A contains the estimate worksheets for each of these alternatives including estimate worksheets for each feature separately.

Tables 1 and 2 are a summary of the costs for the Gallegos and Moncisco damsites, respectively. The 'Combined Cost Estimate' given includes 1) the cost of all features (embankment, spillway, outlet works, and service canal), 2) a 15 percent surcharge for unlisted items, and 3) a 25 percent surcharge for contingencies.

The costs for relocation of the existing facilities such as gas wells, pipelines, roads, and potential archeological sites in the reservoirs were not included in these estimates. Noncontract costs were also not included in these estimates.

**Table 1**  
**Gallegos Wash Damsite**  
**Summary of Alternatives and Cost Estimates**

Alternative No.	Embankment Alternative	Spillway Width	Combined Cost Estimate *
1	Earth core Crest at Elev. 5983	200 feet	\$42 million
2	Cutoff Wall Crest at Elev. 5983	200 feet	\$44 million
3	Earth core Crest at Elev. 5986	100 feet	\$42 million
4	Cutoff Wall Crest at Elev. 5986	100 feet	\$43 million

\* The costs for relocation of the existing facilities such as gas wells, pipelines, roads, and potential archeological sites in the reservoirs were not included in these estimates. Noncontract costs were also not included in these estimates.

**Table 2**  
**Moncisco Wash Damsite**  
**Summary of Alternatives and Cost Estimates**

Alternative No.	Embankment Alternative	Spillway Width	Combined Cost Estimate *
5	Earth Core Crest at Elev. 6040	100 foot	\$37 million
6	Cutoff Wall Crest at Elev. 6040	100 foot	\$36 million
7	Earth Core Crest at Elev. 6045	None	\$34 million
8	Cutoff Wall Crest at Elev. 6045	None	\$37 million

\* The costs for relocation of the existing facilities such as gas wells, pipelines, roads, and potential archeological sites in the reservoirs were not included in these estimates. Noncontract costs were also not included in these estimates.

#### Future Studies

In preparation of these reconnaissance designs, certain issues were identified that were considered to be beyond the scope of these designs, but are worth noting for future work. Other design data needs are also identified for future reference.

Foundation exploration investigations will be needed at either site for final design.

Additional dams site and reservoir topography will be required for the Moncisco Wash site.

The use of the Borrow areas "A" and "D" as core material should be studied further as a potential for cost savings. Additional investigations and analyses would be required to determine if consistent areas of clay materials exist. Borrow areas close to

the Moncisco Wash site should be investigated. In addition, other types of designs for the core should be considered such as an asphaltic core.

A dynamic analysis should be completed. The study should consist of a site specific seismotectonic analysis followed by an evaluation of the foundation and embankment materials. The need for complete removal of the foundation material or alternative methods of foundation treatment should be investigated as a potential cost savings.

Consideration could be given to the use of processed Borrow areas "A" and "D" material as a source of sand filter (zone 2) material. There does not appear to be sufficient gravel to use a source of processed gravel drain (zone 2A).

In addition, the elimination of the gravel drain (zone 2A) should be considered once additional investigation, materials testing, and analyses are performed.

Laboratory testing of potential embankment materials should be completed. Following this, a stability analysis should be performed to determine the optimum slopes for the embankment. Steepening of the slopes could lead to cost savings for the embankment, spillway and outlet works.

The tailwater study needs to be extended to cover the full range of possible spillway flows. The location of the stilling basin in the reconnaissance design was based on extrapolating the existing tailwater curve. More detailed backwater studies need to be performed for the Moncisco Wash site.

Alternative stilling basin designs may be used to reduce costs. One option is to lower the height of the basin walls to allow them to be overtopped for large flows. This option would have lower basin wall costs, but may require a greater amount of erosion protection around the basin.

For either alternative site, consider setting the spillway crest higher than the top of active conservation to allow storage of the 100- to 200-year event. The spillway would be designed as an auxiliary spillway. The cost of an auxiliary spillway can be lower because of the infrequency of use and the acceptance of minor damage during operation. One option would be to eliminate the stilling basin by directing the spillway flows into the drainage located downstream of the dam on the right abutment. This option would depend on the erodability of materials in the drainage. For the reconnaissance design, approximately one-half of the concrete volume for the spillway is in the stilling basin.

For the reconnaissance designs, all outlet works flows are assumed to enter the canal. Conceptual designs will include

accomplished by either a bypass pipe and valve, or a wasteway located in the canal. Sizing of the bypass will be based on required releases into the wash (if any) and reservoir evacuation requirements. The cost of the bypass would be approximately the same for each of the dam alternatives and should be covered under the unlisted items in the reconnaissance design estimates.

### Summary and Conclusions

Gallegos Reservoir is a proposed regulating facility of the Navajo Indian Irrigation Project. At the request of the BIA Reclamation has completed a reconnaissance grade design for the site.

A preliminary design had previously been completed at a site on Gallegos Wash in 1964. The dam axis was moved downstream and a field exploration program was completed in 1991-1992. Designs and cost estimates were completed for this new site along with an alternative upstream site on the Moncisco Wash.

Several alternatives were studied to determine the least cost alternative. Based on the designs and alternatives discussed above, an embankment dam located on the Moncisco Wash site appears to be the least cost alternative. The embankment would consist of an embankment dam with a crest elevation of 6045 feet and a crest width of 30 feet. The embankment would have a height (above streambed) of about 100 feet and a crest length of about 6500 feet. Filters and drains would be included to provide for filtering and drainage of the embankment and foundation. Soil cement would be utilized for erosion protection on the upstream and downstream slopes of the embankment. A low level outlet works would be used for releases. Cost estimates indicate that the spillway/no spillway alternatives are essentially the same cost. Further study could be performed to determine the most economical alternative, but the current estimates are considered adequate for this level of study. For the no spillway case, all flood flows would be stored within the reservoir and, therefore, no spillway would be required. However, a low area would be constructed off the right abutment of the embankment to protect against overflowing of the reservoir.

The estimated cost of this combination of alternatives is approximately \$34-37 million which includes the cost of the embankment, outlet works, service canal, 15 percent unlisted items, and 20 percent contingencies, but does not include noncontract costs or relocation costs.

Items for future study have been identified.

It should be noted that even though the soil-bentonite cutoff wall through the embankment is comparable in cost to the conventional earth core impervious zone, it is not the recommended alternative at this time. Construction of such a

cutoff is possible if necessary because of scarcity of good impervious fill, but technical and construction details would take considerable study. Confidence is high, however, that these details could be solved if necessary. At this time the conventional impervious core is preferred.

## References

- [1] "Geologic Design Data Report for Gallegos Dams and Reservoir Sites," U.S. Bureau of Reclamation - Upper Colorado Report Number G-491, September 1992.
- [2] "Construction Materials Data Report for Gallegos Dam," U.S. Bureau of Reclamation - Upper Colorado Region Report Number G-489, July 1992.
- [3] Memorandum to Study Team Leader, Geotechnical Services, From Sedimentation and River Hydraulics Group, Subject: "Hydraulic, Sediment, and Scour Study for Gallegos Canyon and Moncisco Wash Dam Sites, New Mexico - NIIP Project," Bureau of Reclamation, Denver, Colorado, October 31, 1994.
- [4] Memorandum to Chief, Geotechnical Engineering and Embankment Dams Branch, from Chief Surface Water Branch, Subject: "Probable Maximum Flood Study for Gallegos Dam Sites, Navajo Indian Irrigation Project, New Mexico," Bureau of Reclamation, Denver, Colorado, June 14, 1994.
- [5] Memorandum to Chief, Geotechnical Engineering and Embankment Dams Branch, from Head, Flood Section, Subject: "Gallegos Dam Sites, 100- and 200-Year Flood Hydrographs, Navajo Indian Irrigation Project, New Mexico," Bureau of Reclamation, Denver, Colorado, September 19, 1994.
- [6] "Navajo Regional Seismotectonic Study, Bureau of Indian Affairs, Northeastern Arizona and Northwestern New Mexico," Bureau of Reclamation, Denver, Colorado, November 1991.

Appendix A  
Combined Cost Estimates  
Alternatives 1 thru 8







# ESTIMATE WORKSHEET

<b>FEATURE</b> Gallegos Dam Gallegos Wash  Alternative 4 <small>Filename: GALBEST15.WK3</small>	<b>PROJECT</b> Navajo Indian Irrigation Slurry Wall w/3.1 D/S Slope Crest Elev. 5986  <b>DIVISION</b>  <b>UNIT</b>
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PLANT ACCT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Mobilization & Preparation Work					\$1,450,000
		Excavation for Dam Foundation		900,000	cu yd	\$3.00	\$2,700,000
		Earthfill in Dam Embankment -- Zone 3		2,500,000	cu yd	\$2.00	\$5,000,000
		Furnish & Place Earthfill in Dam -- Zone 2		190,000	cu yd	\$22.00	\$4,180,000
		Furnish & Place Earthfill in Dam -- Zone 2A		170,000	cu yd	\$22.00	\$3,740,000
		Constructing Soil--Bentonite Slurry Wall		290,000	sq ft	\$9.00	\$2,610,000
		Soil--Cement Slope Protection (Upstream & Downstream)		91,000	cu yd	\$26.50	\$2,411,500
		Dewatering			LS		\$200,000
		100' Spillway			LS		\$5,767,420
		Outlet Works			LS		\$1,772,704
		Service Canal			LS		\$292,000
		Subtotal					\$30,123,624
		Allowance for unlisted items			pct		\$4,876,376
		Contract Cost					\$35,000,000
		Contingencies			pct		\$8,000,000
		Field Cost					\$43,000,000

<b>QUANTITIES</b>				<b>PRICES</b>			
BY Vaughan Goldsmith	V6	CHECKED <i>[Signature]</i>		BY <i>[Signature]</i>	1250	CHECKED <i>[Signature]</i>	
DATE PREPARED 02/17/95		APPROVED <i>[Signature]</i>		DATE 2/17/95		PRICE LEVEL	

# ESTIMATE WORKSHEET

<b>FEATURE</b> Gallegos Dam Moncisco Wash  <div style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;">Alternative 5</div> <small>Filename: GALEST3.WK3</small>	<b>PROJECT</b> Navajo Indian Irrigation Zoned Emb. w/3:1 D/S Slope Crest Elev. 6040  <b>DIVISION</b>  <b>UNIT</b>
---	--

PLANT ACCT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Mobilization & Preparation Work					\$1,250,000
		Excavation for Dam Foundation		480,000	cu yd	\$2.50	\$1,200,000
		Earthfill in Dam – Zone 1		250,000	cu yd	\$7.50	\$1,875,000
		Furnish & Place Earthfill in Dam – Zone 2		185,000	cu yd	\$22.00	\$4,070,000
		Furnish & Place Earthfill in Dam – zone 2A		150,000	cu yd	\$22.00	\$3,300,000
		Earthfill in Dam Embankment – zone 3		1,750,000	cu yd	\$2.00	\$3,500,000
		Soil–Cement Slope Protection (Upstream & Downstream)		100,000	cu yd	\$26.50	\$2,650,000
		Dewatering		1	LS		\$200,000
		Spillway, 100' crest length		1	LS		\$5,767,420
		Outlet Works		1	LS		\$1,772,704
		Service Canal		1	LS		\$292,000
Notes: Reduced horizontal filter thicknesses to 5' in abutments (Sta. 10+00 to 20+00 and Sta. 65+00 to 70+00).							
		Subtotal					\$25,877,124
		Allowance for unlisted items 5/8%			pct		\$4,122,876
		Contract Cost					\$30,000,000
		25% Contingencies			pct		\$7,000,000
		Field Cost					\$37,000,000

QUANTITIES				PRICES			
BY Vaughan Goldsmith	16	CHECKED <i>[Signature]</i>		BY <i>[Signature]</i>	CHECKED <i>[Signature]</i>		
DATE PREPARED 02/17/95		APPROVED <i>[Signature]</i>		DATE 2/17/95		PRICE LEVEL	

# ESTIMATE WORKSHEET

<b>FEATURE</b>  Gallegos Dam Moncisco Wash  Alternative 6 <small>(file:///c:/GALEST8.WK3)</small>	<b>PROJECT</b> Navajo Indian Irrigation Slurry Wall w/3:1 D/S Slope Crest Elev. 6040  <b>DIVISION</b>  <b>UNIT</b>
---	---

PLANT ACCT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Mobilization & Preparation Work					\$1,200,000
		Excavation for Dam Foundation		480,000	cu yd	\$2.50	\$1,200,000
		Earthfill in Dam Embankment -- Zone 3		1,950,000	cu yd	\$2.00	\$3,900,000
		Furnish & Place Earthfill in Dam -- zone 2		190,000	cu yd	\$22.00	\$4,180,000
		Furnish & Place Earthfill in Dam -- zone 2A		150,000	cu yd	\$22.00	\$3,300,000
		Constructing Soil-Bentonite Slurry Wall		300,000	S.F.	\$9.00	\$2,700,000
		Soil-Cement Slope Protection (Upstream and Downstream)		100,000	cu yd	\$26.50	\$2,650,000
		Dewatering			LS		\$200,000
		Spillway, 100' crest length			LS		\$2,705,250
		Outlet Works			LS		\$1,772,704
		Service Canal			LS		\$1,499,400
		Subtotal					\$25,307,354
		Allowance for unlisted items			pct		\$3,692,646
		Contract Cost					\$29,000,000
		Contingencies			pct		\$7,000,000
		Field Cost					\$36,000,000

<b>QUANTITIES</b>			<b>PRICES</b>		
BY Vaughan Goldsmith	V6	CHECKED <i>George W. ...</i>	BY <i>J.W. Lawrence</i>	CHECKED	
DATE PREPARED	02/17/95	APPROVED	DATE	PRICE LEVEL	
			2/17/95		





## Individual Feature Cost Estimates

Spillway

Outlet Works

Service Canal

ESTIMATE WORKSHEET

**FEATURE:**  
 Gallegos Dam  
 Gallegos Wash site  
 Top of Dam Elev 5986  
 Spillway  
 Crest length = 100 ft

24-Jan-95

**PROJECT:**  
 Navajo Indian Irrigation Project

---

**DIVISION:**

---

**UNIT:**

PLANT ACCT.	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		SPILLWAY					
		Excavation for spillway	D8131	125,000	CY	3.00	375,000.00
		Concrete in spillway	D8131				
		Concrete in walls		3,130	CY	300.00	939,000.00
		Concrete in slab, crest, keys, cutoffs, ogee, baffle peirs, chute blocks		10,600	CY	200.00	2,120,000.00
		Concrete in spillway mudslab	D8131	690	CY	150.00	103,500.00
		Reinforcement 150 lb/cy	D8131	2,100,000	LBs	0.60	1,260,000.00
		Cement 564 lb/cy	D8131	4,050	Tons	100.00	405,000.00
		Backfill	D8131	58,300	CY	2.40	139,920.00
		Riprap 24" max size	D8131	17,000	CY	25.00	425,000.00
		<b>SUBTOTAL -- Gallegos Wash Site, 100 ft spillway</b>					<b>5,767,420.00</b>

QUANTITIES		PRICES	
BY R. McGovern		BY <i>Chris Little</i> D-8170	CHECKED <i>LM</i>
DATE PREPARED 13-Jan-95	APPROVED	DATE 24-Jan-95	PRICE LEVEL

ESTIMATE WORKSHEET

FEATURE:  
 Gallegos Dam  
 Gallegos Wash site  
 Top of Dam Elev 5983  
 Spillway  
 Crest length = 200 ft

24-Jan-95

PROJECT:  
 Navajo Indian Irrigation Project

DIVISION:

UNIT:

PLANT ACCT.	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		SPILLWAY					
		Excavation for spillway	D8131	132,000	CY	3.00	396,000.00
		Concrete in spillway	D8131				
		Concrete in walls		2,300	CY	300.00	690,000.00
		Concrete in slab, crest, keys, cutoffs, ogee, baffle peirs, chute blocks		16,000	CY	200.00	3,200,000.00
		Concrete in spillway mudslab	D8131	1,150	CY	150.00	172,500.00
		Reinforcement 150 lb/cy	D8131	2,800,000	LBs	0.60	1,680,000.00
		Cement 564 lb/cy	D8131	5,500	Tons	100.00	550,000.00
		Backfill	D8131	41,300	CY	3.00	123,900.00
		Riprap 24" max size	D8131	17,600	CY	25.00	440,000.00
		SUBTOTAL - Gallegos Wash Site, 200 ft Spillway					7,252,400.00

QUANTITIES		PRICES	
BY R. McGovern		BY <i>Chapman</i> D-8170	CHECKED <i>PXB</i>
DATE PREPARED 13-Jan-95	APPROVED	DATE 24-Jan-95	PRICE LEVEL

ESTIMATE WORKSHEET

FEATURE:  
 Gallegos Dam  
 Moncisco Wash site  
 Top of Dam Elev 6040  
 Spillway  
 Crest length = 100 ft  
 Chute converges to 80 ft

24-Jan-95

PROJECT:  
 Navajo Indian Irrigation Project

DIVISION:

UNIT:

PLANT ACCT.	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		SPILLWAY					
		Excavation for spillway	D8131	43,000	CY	4.00	172,000.
		Concrete in spillway	D8131				
		Concrete in walls		1,260	CY	300.00	378,000.
		Concrete in slab, crest, keys, cutoffs, ogee, baffle peirs, chute blocks		5,200	CY	200.00	1,040,000.
		Concrete in spillway mudslab	D8131	450	CY	175.00	78,750.
		Reinforcement 150 lb/cy	D8131	970,000	LBs	0.60	582,000.
		Cement 564 lb/cy	D8131	1,950	Tons	100.00	195,000.
		Backfill	D8131	22,500	CY	3.00	67,500.
		Riprap 24" max size	D8131	6,400	CY	30.00	192,000.
		SUBTOTAL - Moncisco Wash site, 100' spillway					2,705,250.

QUANTITIES		PRICES	
BY R. McGovern		BY <i>Charles Damm</i> D-8170	CHECKED <i>RAS</i>
DATE PREPARED 13-Jan-95	APPROVED	DATE 24-Jan-95	PRICE LEVEL





# ESTIMATE WORKSHEET

**FEATURE**  
 GALLEGOS DAM SERVICE CANAL  
 APPRAISAL ESTIMATE  
 MONCISCO WASH DAM SITE - Q = 260 CFS

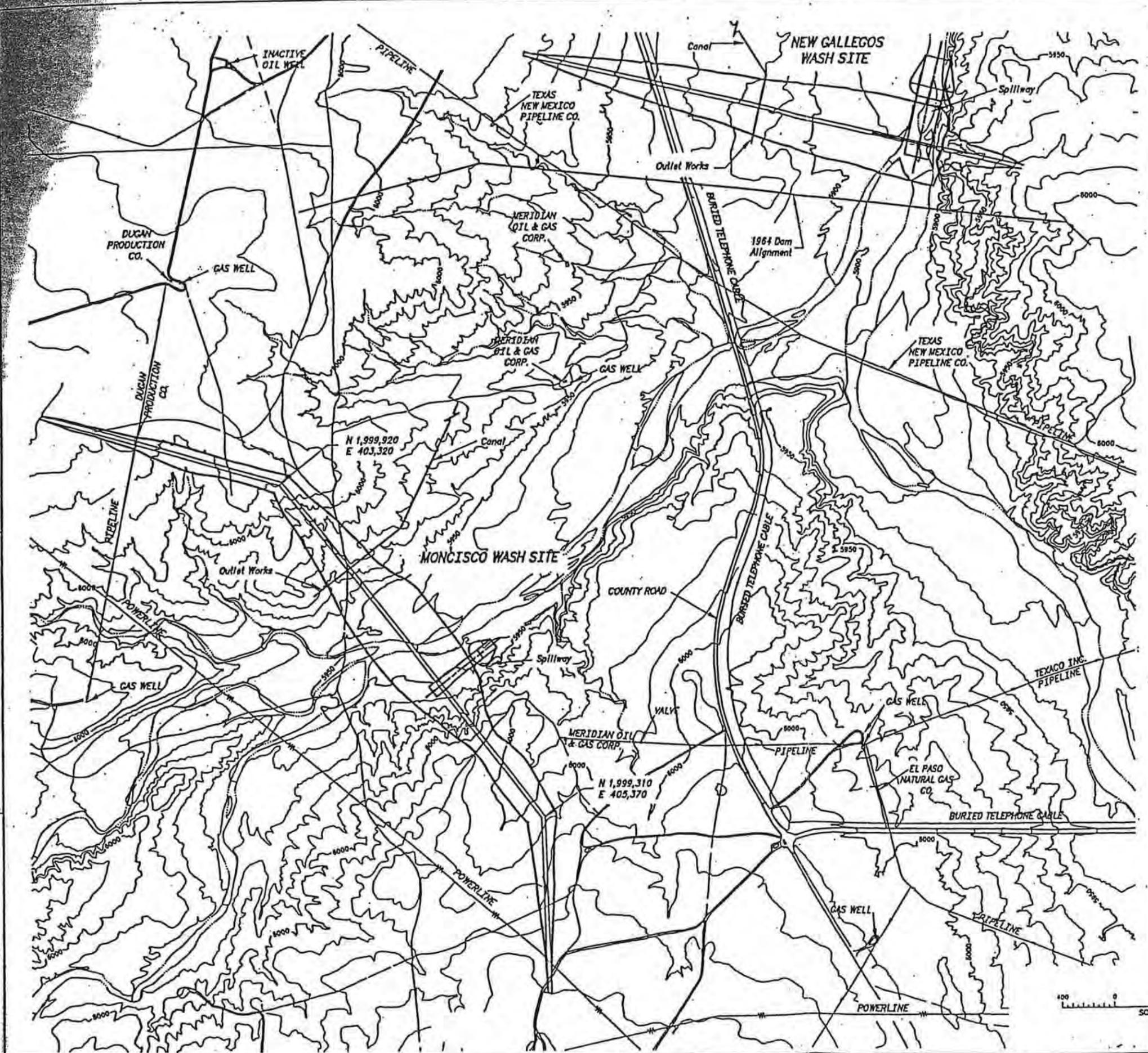
**PROJECT**  
 NAVAJO INDIAN IRRIGATION

**DIVISION**

**UNIT**

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	1	CONSTRUCTING A SERVICE CANAL 11,000 FT LONG CONCRETE-LINED (T=2.5'), BASE WIDTH = 8 FT., WATER DEPTH = 3.66 FT., Q= 260 CFS. SIDE SLOPES = 1.5 : 1 ASSUME EXCAVATION WILL EQUAL REQUIRED EMBANKMENT MATERIAL CANAL WILL CONNECT WITH THE GRAVITY MAIN CANAL AT STA. 2457+25BK Q=670 CFS BW = 12 FT, D=8.94 FT, SS= 1.5:1 CONSTRUCTING A DROP STRUCTURE AND CHUTE 900 FT. LONG, BW =10 FT,D=3.66, H=5 FT					
		EXCAVATION FOR CANAL		39,000	CY	\$2.40	\$93,600
		COMPACTED EMBANKMENT FOR CANAL		39,000	CY	\$3.00	\$117,000
		CONCRETE IN CANAL LINING		2,150	CY	\$100.00	\$215,000
		CONNECTION TO GRAVITY MAIN CANAL		1	LS	\$30,000.00	\$30,000
		ROAD CROSSING STRUCTURE		1	LS	\$30,000.00	\$30,000
		STRUCTURE EXCAVATION		4,000	CY	\$4.50	\$18,000
		COMPACTED BACKFILL ABOUT STRUCTURES		2,100	CY	\$8.00	\$16,800
		CONCRETE IN STRUCTURES		3,300	CY	\$250.00	\$825,000
		CEMENTITIOUS MATERIALS		1,000	TONS	\$100.00	\$100,000
		REINFORCEMENT IN STRUCTURES		90,000	LBS	\$0.60	\$54,000
		<b>SUBTOTAL - SERVICE CANAL MONCISCO WASH DAM SITE</b>					<b>\$1,499,400</b>

<b>QUANTITIES</b>		<b>PRICES</b>	
BY RPFUERST	CHECKED FTAN	BY <i>[Signature]</i>	CHECKED RAB
DATE PREPARED December 28, 1994	APPROVED	DATE 23-Jan-95	PRICE LEVEL



LEGEND

POWERLINE

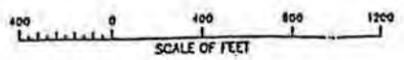
PIPELINE

REFERENCE DRAWINGS

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- MONCISCO WASH SITE 809-D-4583

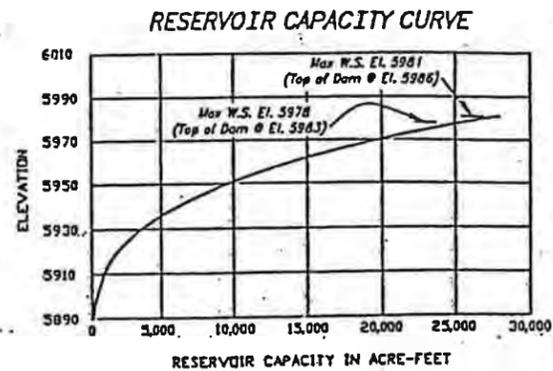
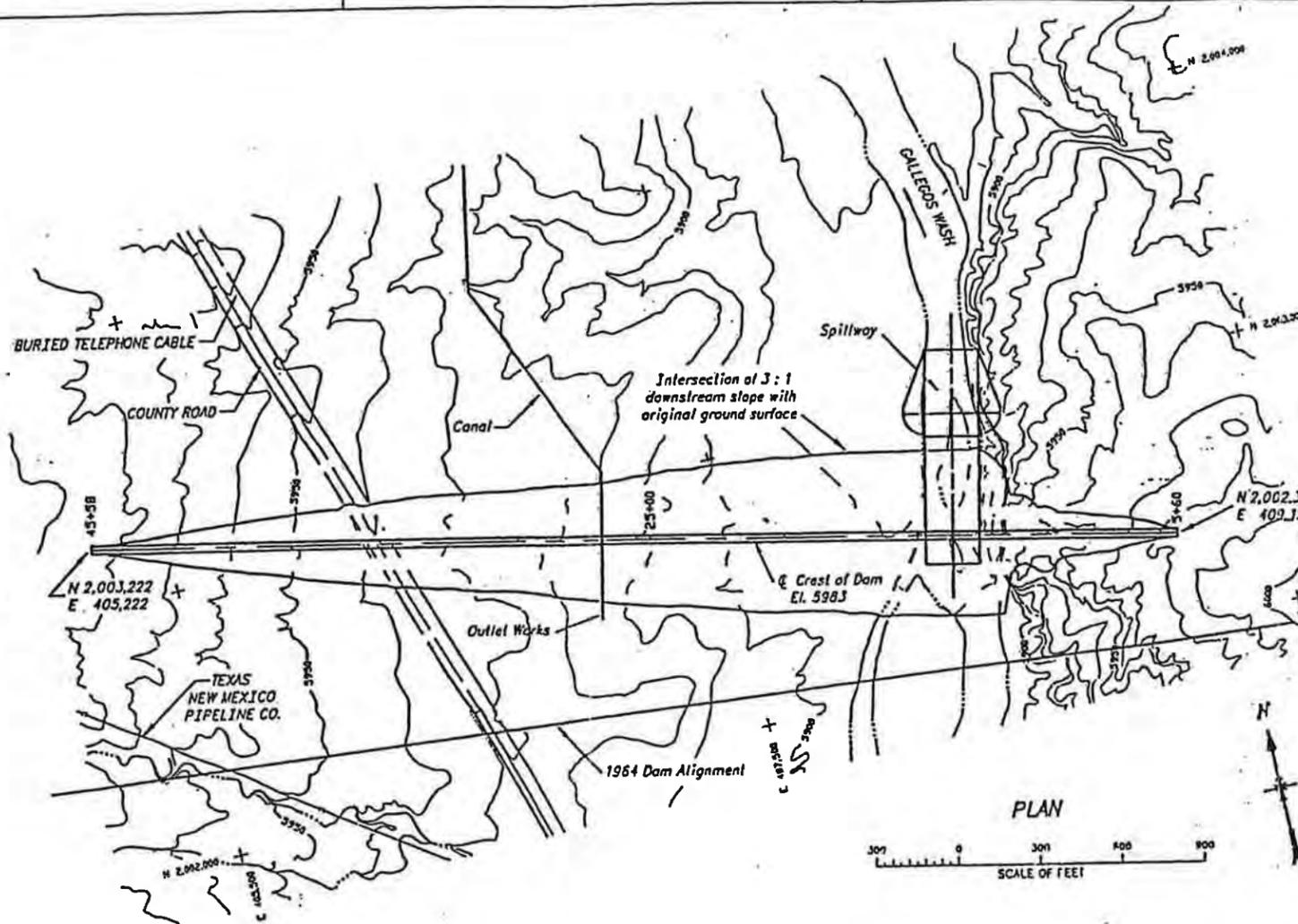
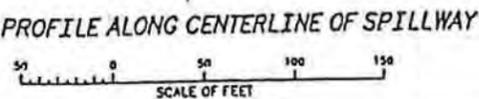
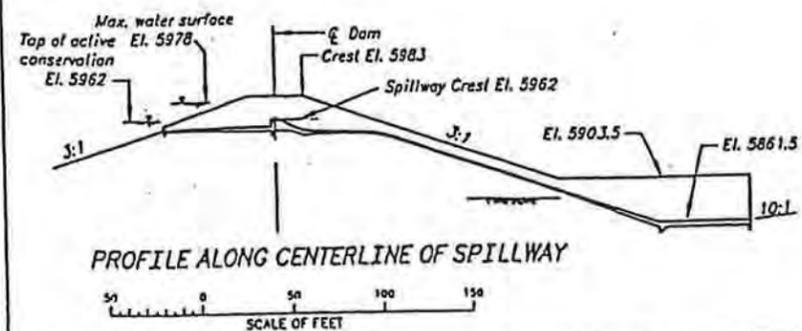
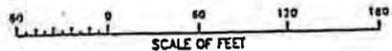
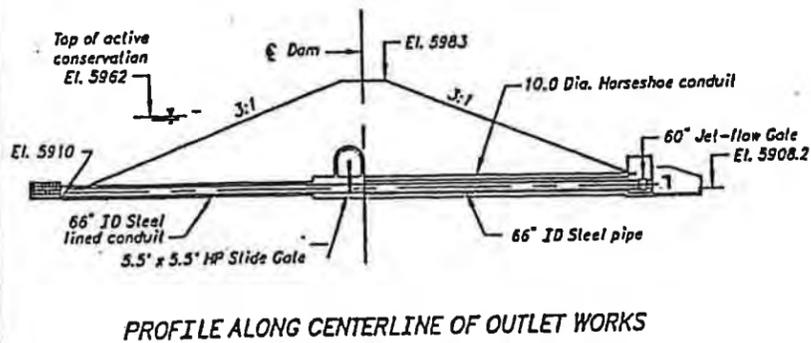
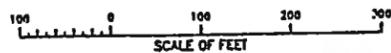
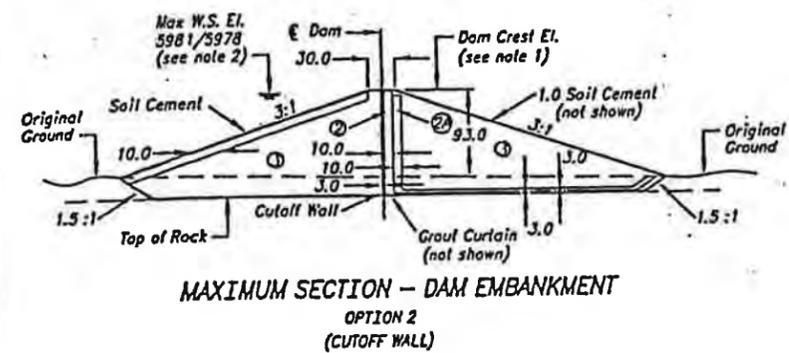
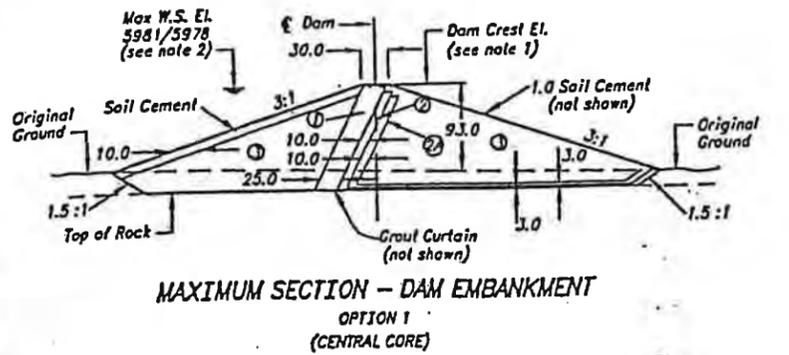
ALWAYS THINK SAFETY  
 UNITED STATES  
 DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECREATION  
 UPPER COLORADO REGION  
 NAVAJO INDIAN IRRIGATION PROJECT  
**GALLEGOS DAM**  
**RECONNAISSANCE DESIGN**

DESIGNED BY *[Signature]* CHECKED *[Signature]*  
 DRAWN BY *[Signature]* FIELD APPR. *[Signature]*  
 APPROVED *[Signature]*  
 FEB 1985



DENVER, COLORADO      Feb. 12, 1985      809-D-4581

Figure 1



NOTES

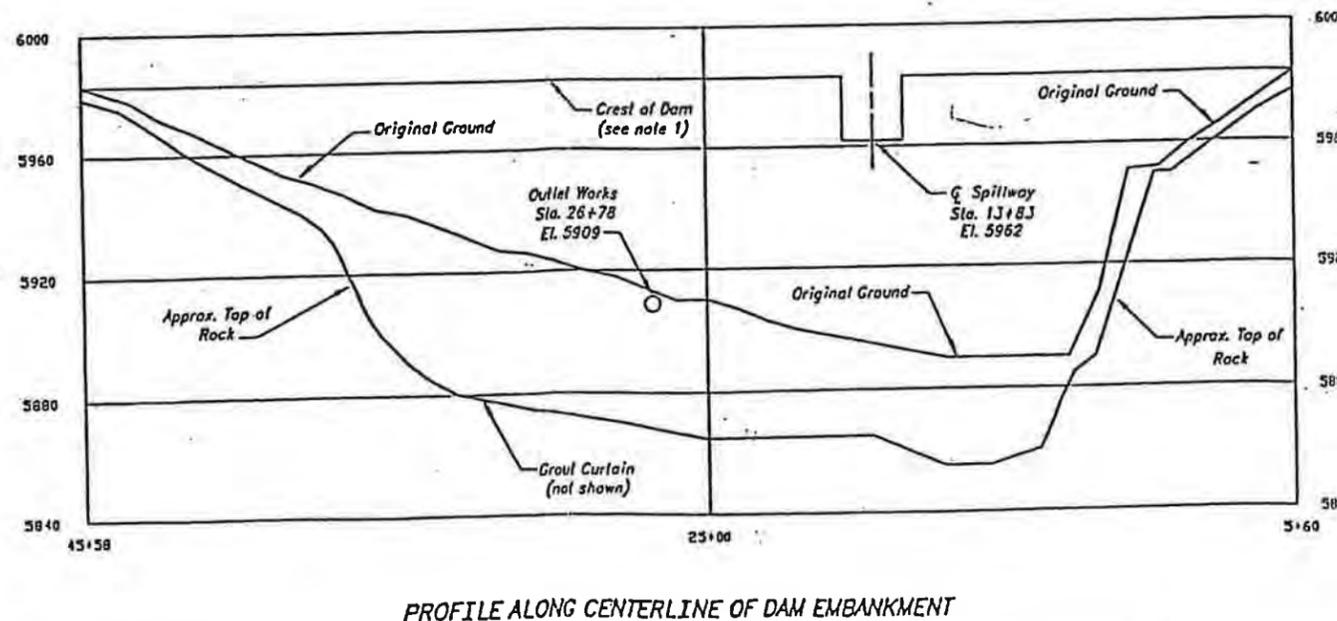
1. Crest of dam varies based on spillway option. Crest of dam elevation 5983 and 200 ft. wide spillway shown.
2. Crest elevation 5983 and MWS elevation 5978 are for the 200 foot wide spillway option. Crest elevation 5986 and MWS elevation 5981 are for the 100 foot wide spillway option.

EMBANKMENT EXPLANATION

- ① Selected clay material
- ② Processed sand filler material
- ③ Processed gravel drain material
- ④ Clay, silt, sand, gravel from borrow areas and required excavation

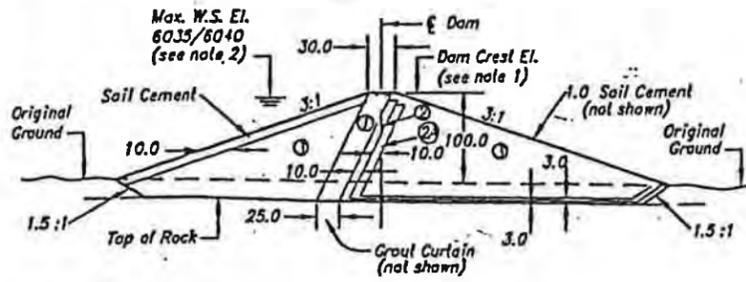
REFERENCE DRAWINGS

VICINITY MAP 809-D-4581

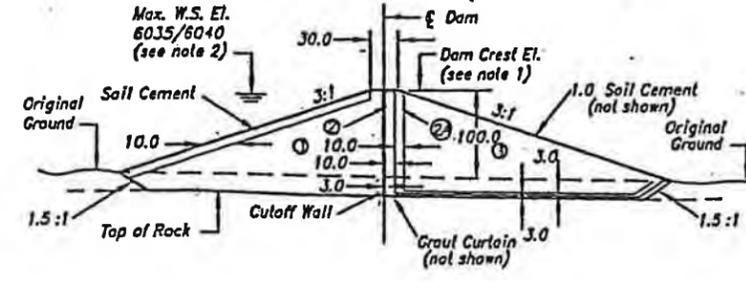


PROFILE ALONG CENTERLINE OF DAM EMBANKMENT

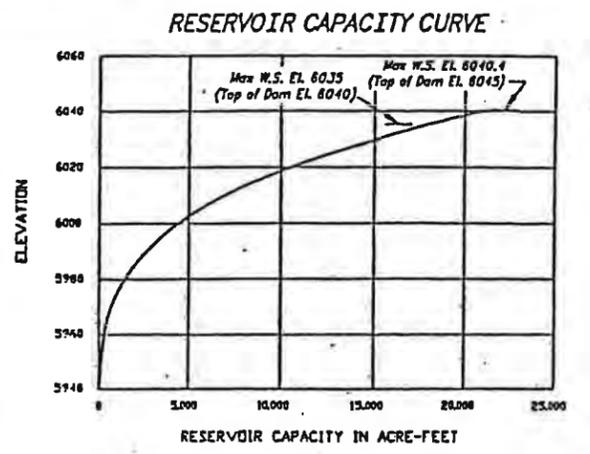
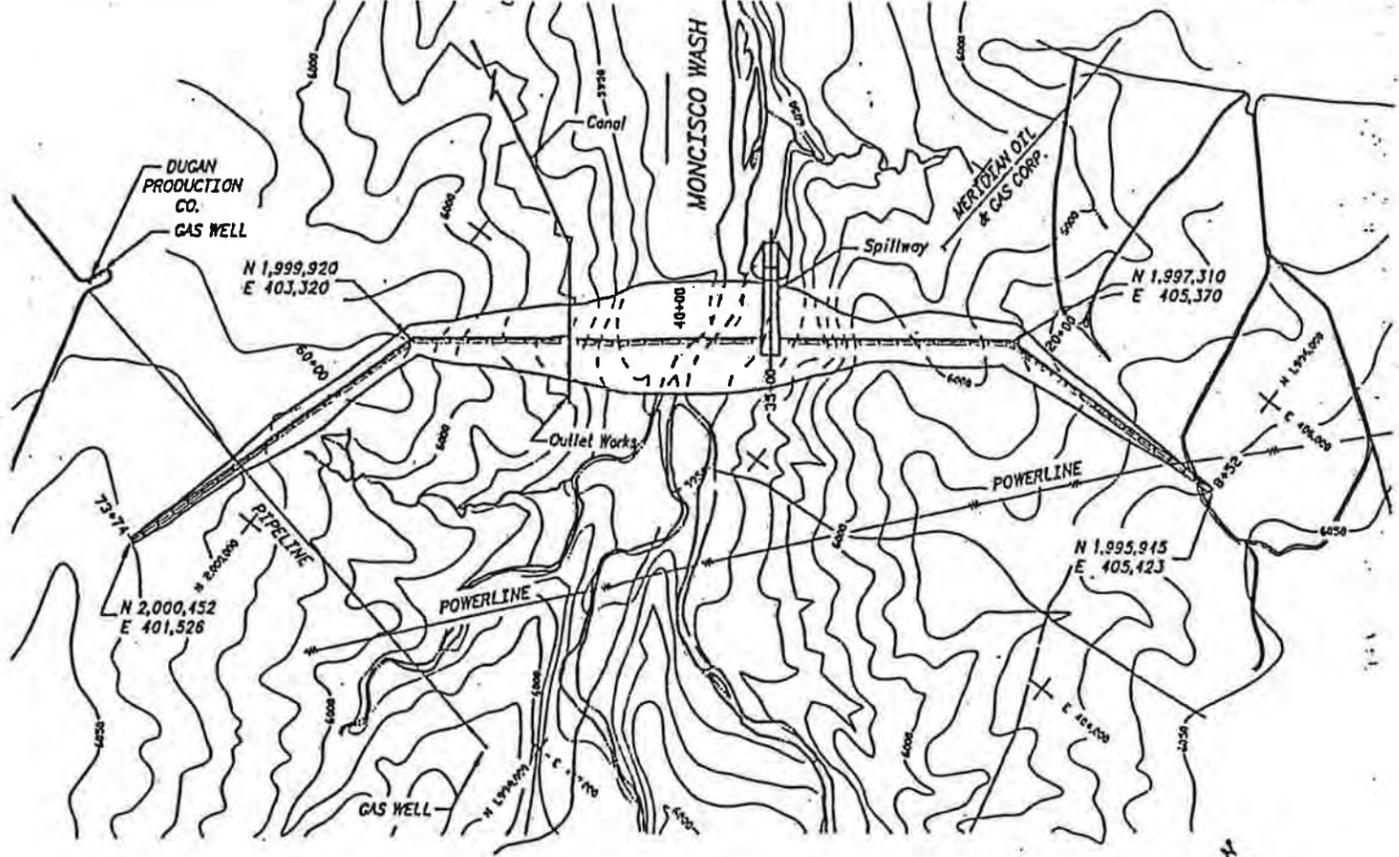
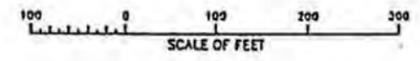
ALWAYS THINK SAFETY		
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION UPPER COLORADO REGION NAVAJO INDIAN IRRIGATION PROJECT		
GALLEGOS DAM RECONNAISSANCE DESIGN NEW GALLEGOS WASH SITE PLAN, PROFILE, & SECTIONS		
DESIGNED BY: [Signature]	CHECKED BY: [Signature]	DATE AND TIME PLOTTED: [Blank]
DRAWN BY: [Signature]	APPROVED BY: [Signature]	FILE NUMBER: 809-D-4582
CAD SYSTEM: AutoCAD	CAD FILENAME: [Blank]	DATE AND TIME PLOTTED: [Blank]
DESIGNER: COLCADO	FILE NO: 1003	809-D-4582



MAXIMUM SECTION - DAM EMBANKMENT  
OPTION 1  
(CENTRAL CORE)



MAXIMUM SECTION - DAM EMBANKMENT  
OPTION 2  
(CUTOFF WALL)



NOTES

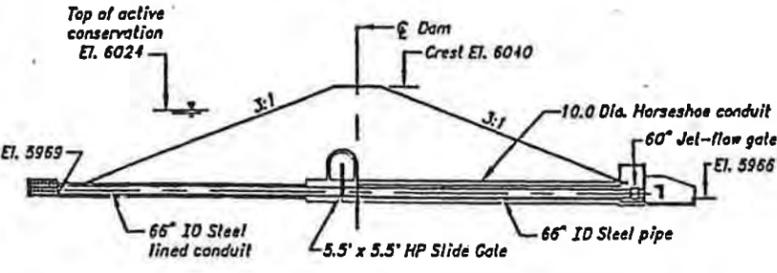
1. Crest of dam varies based on spillway alternative. Crest of dam elevation 6040 and 100 foot wide spillway alternative are shown.
2. Crest elevation 6040 and MWS elevation 6035 are for the 100 foot wide spillway option. Crest elevation 6045 and MWS elevation 6040 are for the no spillway alternative.

EMBANKMENT EXPLANATION

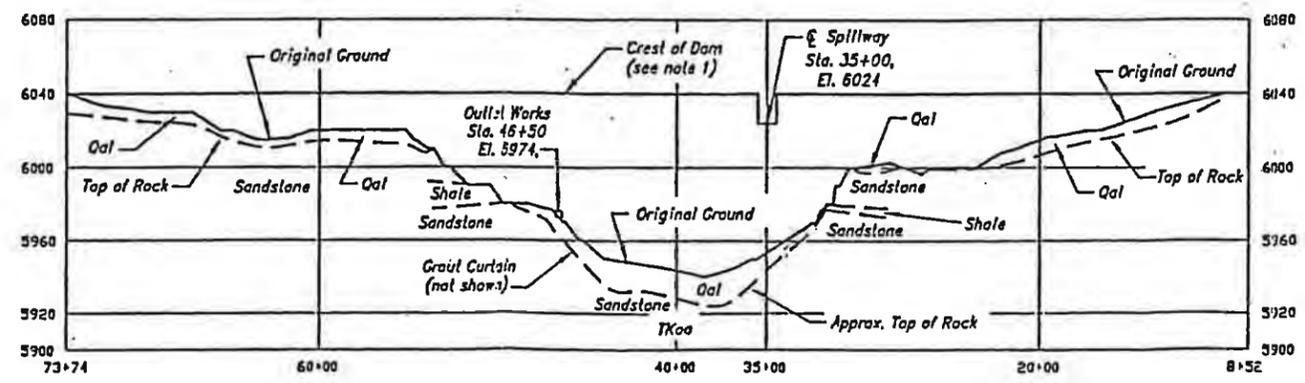
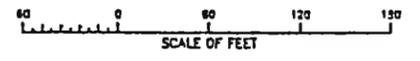
- ① Selected clay material
- ② Processed sand filter material
- ③ Processed gravel drain material
- ④ Clay, silt, sand, gravel, from borrow areas and required excavation

REFERENCE DRAWINGS

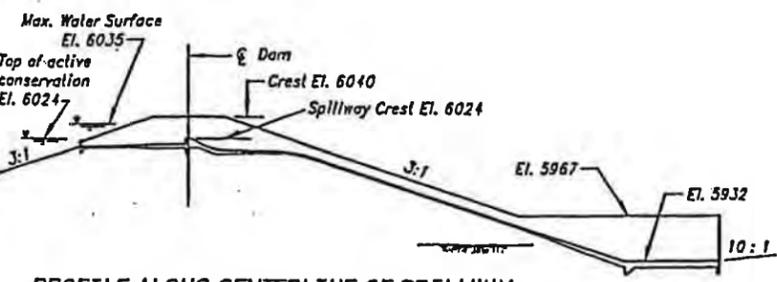
VICINITY MAP - 809-D-4581



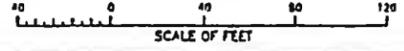
PROFILE ALONG CENTERLINE OF OUTLET WORKS



PROFILE ALONG CENTERLINE OF DAM EMBANKMENT



PROFILE ALONG CENTERLINE OF SPILLWAY



ALWAYS THINK SAFETY

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
UPPER COLORADO REGION  
NAVAJO INDIAN IRRIGATION PROJECT

**GALLEGOS DAM  
RECONNAISSANCE DESIGN  
MONISCO WASH SITE**

PLAN, PROFILE, & SECTIONS

DESIGNED BY: [Signature] CHECKED BY: [Signature]  
DRAWN BY: [Signature] RECL. APPR. [Signature]  
APPROVED BY: [Signature]

CAD SYSTEM: [Signature] CAD FILENAME: [Signature] DATE AND TIME PLOTTED: [Signature]  
PLOTTER: [Signature] PLOT DATE: Feb 14, 1993

809-D-4583

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix G**

**WATER SUPPLY AND STORAGE OPTIONS**  
**Gallup Navajo Pipeline Project**  
**1996**



# WATER SUPPLY AND STORAGE OPTIONS GALLUP NAVAJO PIPELINE PROJECT

Engineering and Cost Estimates  
Appraisal Level Report

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
FARMINGTON CONSTRUCTION OFFICE

August 1996

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A. PURPOSE AND OBJECTIVE

The purpose of this document is to provide appraisal-level cost estimates for potential alternatives to deliver water to the proposed Gallup-Navajo Pipeline Project (GNPP). The document also focuses on the relationship and compatibility of GNPP and the Navajo Indian Irrigation Project (NIIP). Alternatives for delivering and storage of water not using NIIP facilities are also considered.

This document presents engineering possibilities and associated costs for the proposed alternatives. It is intended to provide a basis for further detailed analysis if desired.

B. BACKGROUND

Investigations for a "Gallup Project" were initiated by the Bureau of Reclamation in the early 1970's. Initially the investigation was intended to develop a water supply for the city of Gallup, New Mexico. In early 1975 the Navajo Nation indicated an interest to join in the development of a water supply system from the San Juan River to meet immediate and long term demands of the city of Gallup and communities on the Navajo Indian Reservation. Various studies and reports have been prepared to date (see References).

An Engineering and Cost Estimates Technical Appraisal Report [1] was prepared by the Bureau of Reclamation in November, 1993. Three alternatives to supply water were evaluated (A, B, and C). All three alternatives were based on obtaining water from NIIP at Gallegos Reservoir. The Engineering and Cost Estimates Technical Appraisal Report assumed Gallegos Reservoir would be built as a planned feature of NIIP to provide water during periods of peak irrigation demand and would be available to provide winter storage for GNPP when the canals are out of operation. Alternative C was based on an average water requirement of 42 cfs (30,715 AF/YR) and is the basis for this report.

The beginning point of GNPP was envisioned to be the intake to the water treatment plant located below the reservoir. Of the 30,715 acre-feet annual supply, 5940 acre-feet was to be delivered to the city of Gallup, 16,955 acre-feet to communities on the Navajo Indian Reservation, and 7,820 acre-feet to NAPI for food processing plants. The route of the main pipeline would run from Gallegos Reservoir to a point near Twin Lakes, south to Yah-ta-hey, then west to Window Rock.

A report prepared for the Bureau of Indian Affairs by Keller-Bliesner Engineering (KBE) in May 1995 titled "Navajo Indian Irrigation Project, Gallegos Reservoir Needs and Cost Assessment" [2] indicates Gallegos Reservoir is not needed to supply peak irrigation demands.

### C. INTRODUCTION

This report will look at three options to supply water to GNPP, including: use of the existing NIIP canal system with three different operating seasons; a pipeline from the San Juan River to a storage reservoir; and a pipeline from Navajo Reservoir to a storage reservoir. The report also investigates three storage reservoir site options.

For the purpose of this report it is assumed a storage reservoir to supply NIIP peak irrigation demands is not needed. It is also assumed that during the month of July NIIP facilities will be operating at peak capacity to serve NAPI irrigation demand.

Ongoing studies by KBE indicates the possibility of supplying a portion of the water for GNPP from NIIP drainage and return flows. This option should be addressed in a future report when KBE's studies are complete.

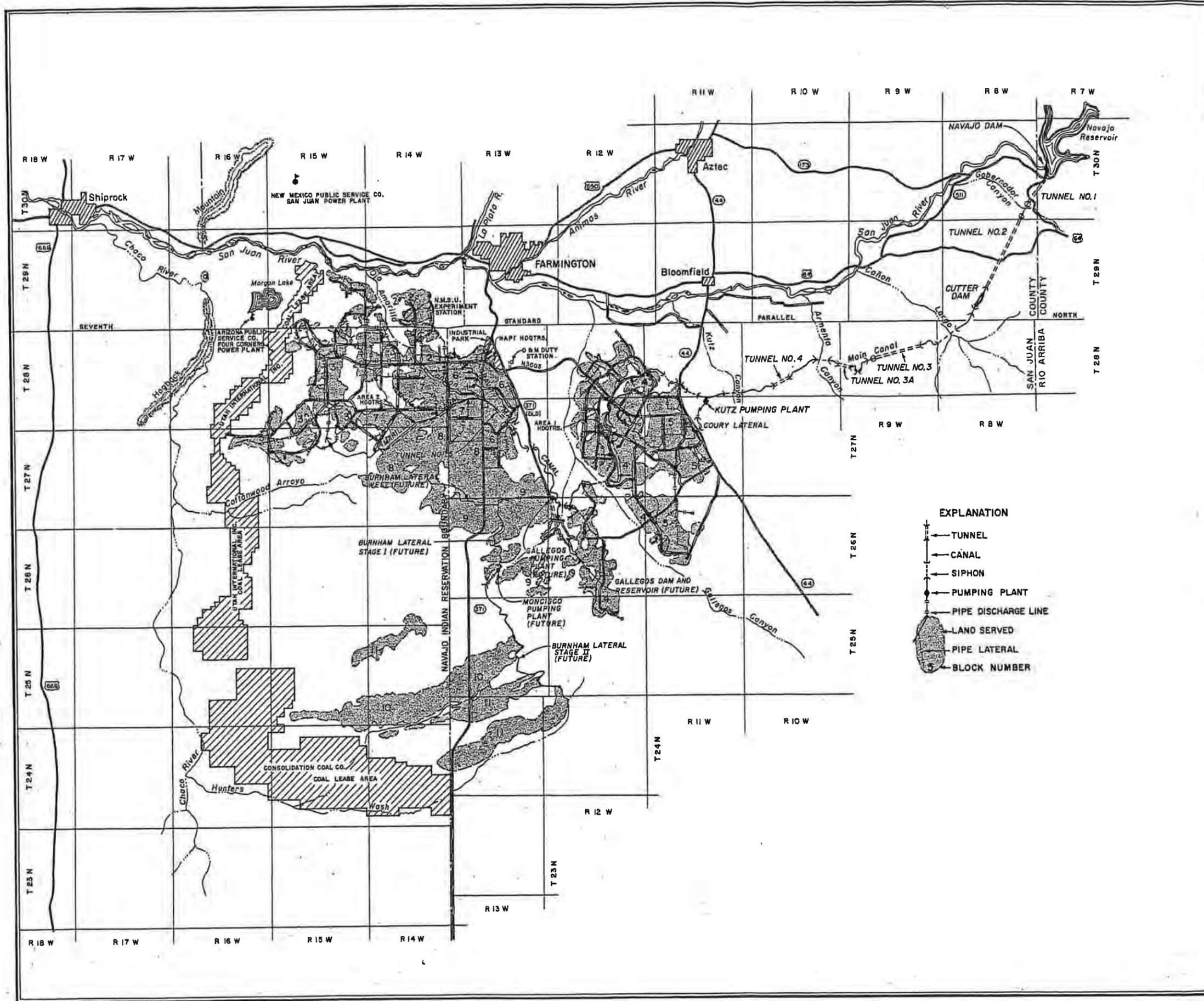
### D. WATER SUPPLY OPTIONS FOR GNPP

#### 1. Use of NIIP Canal System to Supply GNPP

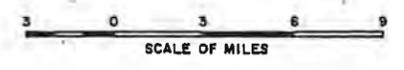
a. General - The Navajo Indian Irrigation Project was authorized for construction on June 13, 1962 by Public Law 87-483 and amended on September 23, 1970 by Public Law 91-416. The Project has the principal purpose of furnishing irrigation water from Navajo Reservoir to 110,630 acres of land for the benefit of the Navajo Nation.

The Main, Gravity Main, and Amarillo Canals convey water by gravity flow to the project lands (see Information Map next page). The canals range in capacity from 1800 cfs to 170 cfs and have a combined length of 71.4 miles. The canals consist of 48.8 miles of concrete-lined canal, 1.2 miles of plastic membrane-lined canal, 12.8 miles of tunnels, 7.1 miles of siphons, and a 1.5 mile long channel and in-line reservoir formed behind Cutter Dam.

In November 1981, after three years of consumptive use and system capacity studies, BIA and BOR concurred on design criteria based on a peak farm delivery



- EXPLANATION**
- TUNNEL
  - CANAL
  - SIPHON
  - PUMPING PLANT
  - PIPE DISCHARGE LINE
  - ▨ LAND SERVED
  - PIPE LATERAL
  - ⑤ BLOCK NUMBER



UNITED STATES  
 DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECLAMATION  
 NAVAJO INDIAN IRRIGATION PROJECT  
 NEW MEXICO  
**INFORMATION MAP**  
 UPPER COLORADO REGION  
 MAP NO. 809-500-14  
 JANUARY 1991

rate of 9.0 gpm/acre for 11 consecutive days on a net irrigated land base of 110,630 acres. Using this criteria, Gallegos Reservoir was required to provide supplemental storage to accommodate the peak demand.

KBE performed a study in May, 1995 which included an analysis of the canal conveyance capacity. The analysis determined the limiting capacity (gpm/acre) of each canal reach. The limiting capacity is based on design canal capacity and downstream acres. The results indicate that Main Canal reaches from the headworks to mile post 46.5 have the smallest capacities (from 7.30 to 7.02 gpm/acre). Main Canal mile post 42.8 to 46.2 (7.03 gpm/acre) and mile post 46.2 to 0.7 of Gravity Main Canal (7.02 gpm/acre) are the limiting reaches. The study concluded that the limiting capacity of the NIIP canal system is 7 gpm/acre assuming no fallow land and irrigation of the full 110,630 acres.

KBE also analyzed crop mix and maximum water use. Utilizing historical crop mix data and mean conveyance and application efficiencies, the peak diversion requirement was calculated to be 6.54 gpm/acre, which is less than the limiting capacity of the canal system. The study concluded that the existing canal capacity is adequate to meet peak demands in the driest conditions with the highest water use crop mix without adding peaking capacity with the proposed Gallegos Reservoir.

Based on these previous studies, it will be assumed the canal system has the capacity to deliver the peak irrigation demand.

b. NIIP Operating Seasons - The ability to supply water to GNPP using NIIP canals depends on the canal capacities available, reservoir storage capacity, and the canal operating seasons. NIIP canals are normally operated from April 1 to October 31 of each year. Since the GNPP will require water all year long, storage will be required to provide water to GNPP during the winter and during peak summer irrigation demand.

Table 1 shows canal capacities available in a typical year for Gravity Main Canal, Burnham Lateral, Burnham Lateral West and Amarillo Canal based on NAPI demand as a percentage of peak capacity. NAPI irrigation demand will limit the volume of water available to GNPP. NAPI demand of peak capacity percentages were developed based on 1994 and 1995 water use records.

The three operating season options evaluated using Table 1 available canal capacities are: current normal irrigation season from April 1 to October 31;

extended irrigation season from March 1 to October 31; and all year operation of the canal system. Table 2 shows the monthly average canal capacity needed to supply 30,715 acre-feet of water for each season.

Table 1 NIIP Canal Capacities Available for GNPP

Month	NAPI Demand of Peak Capacity (%) (1)	Gravity Main Canal Capacity Available for GNPP (cfs) (2)	Burnham Lateral Capacity Available for GNPP (cfs) (2)	Burnham Lateral West Capacity Available for GNPP (cfs) (2)	Amarillo Canal Capacity Available for GNPP (cfs) (2)
Jan	0	1285	880	320	190
Feb	0	1285	880	320	190
Mar	0	1285	880	320	190
April	25	964	660	240	143
May	55	578	396	144	86
June	75	321	220	80	48
July	100	0	0	0	0
Aug	82	231	158	58	34
Sept	50	643	440	160	95
Oct	17	1067	730	266	158
Nov	0	1285	880	320	190
Dec	0	1285	880	320	190

- (1) Assumes July supplies NAPI peak demand only. All other months are assumed NAPI demand as a percentage of peak.
- (2) Available canal capacities are based on design capacity minus NAPI irrigation demand. Canals are assumed to be operating at full capacity in the peak month to maintain NAPI's operational flexibility.

**Table 2 Average Canal Capacities Required for GNPP**

Month	Average Canal Capacity Needed for Normal Irrigation Season 4/1 thru 10/31 (cfs)	Average Canal Capacity Needed for Extended Irrigation Season 3/1 thru 10/31 (cfs)	Average Canal Capacity Needed for All Year Operation 1/1 thru 12/31 (cfs)
Jan	0.0	0.0	46.4
Feb	0.0	0.0	46.4
Mar	0.0	72.4	46.4
April	84.6	72.4	46.4
May	84.6	72.4	46.4
June	84.6	72.4	46.4
July	0.0	0.0	0.0
Aug	84.6	72.4	46.4
Sept	84.6	72.4	46.4
Oct	84.6	72.4	46.4
Nov	0.0	0.0	46.4
Dec	0.0	0.0	46.4

Normal Operating Season - To supply GNPP 30,715 acre-feet from April 1 to October 31 each year, a daily average volume of 168 acre-feet (84.6 cfs) is required. This volume must be conveyed in 183 days when it is assumed July serves NAPI requirements only.

Table 3 shows an example operating plan using Gallegos Pumping Plant to pump to Burnham Lateral. From Burnham Lateral the water would be released into a stabilized natural channel to flow into Moncisco Reservoir.

Assuming NIIP facilities only operate during the normal irrigation season, a storage reservoir with an active capacity of at least 11,000 acre-feet is needed. The size of the reservoir is dependent on the GNPP demand for the November 1 through March 31 period.

Table 3 Delivery from Burnham Lateral - Normal Irrigation Season

Month	Days Available to Supply GNPP	NAPI Demand of Peak Capacity (%) (1)	NAPI Demand in Burnham Lateral (cfs)	Average Capacity Required for GNPP (cfs)	Acre-feet Supplied to GNPP	Acre-feet Demand by GNPP (2)	Cumulative Storage Volume Required by GNPP (acre-feet)
Jan	0	0	0	0	0	2000	-2000
Feb	0	0	0	0	0	2000	-4000
Mar	0	0	0	0	0	2200	-6200
April	30	25	220	84.6	5035	2400	-3565
May	31	55	484	84.6	5203	2600	-962
June	30	75	660	84.6	5035	3000	1073
July	0	100	880	0	0	3315	-2242
Aug	31	82	722	84.6	5203	3000	-39
Sept	30	50	440	84.6	5035	2800	2196
Oct	31	17	150	84.6	5204	2600	4800
Nov	0	0	0	0	0	2400	2400
Dec	0	0	0	0	0	2400	0
TOTALS					30715	30715	11000 (3)

- (1) Assumes July supplies NAPI peak demand only. All other months are assumed NAPI demand as a percentage of peak.
- (2) GNPP monthly demand distribution is based on Gallup NM 1994 water use.
- (3) Required active storage is sum of the absolute value of largest negative storage volume and largest positive storage volume ( $|-6200| + 4800 = 11,000$ ).

Extended Operating Season - To supply GNPP 30,715 acre-feet from March 1 to October 31 each year, a daily average volume of 144 acre-feet (72.4 cfs) is required. This volume must be conveyed in 214 days when it is assumed July serves NAPI requirements only.

Table 4 shows an example operating plan using Gallegos Pumping Plant to pump to Burnham Lateral West. From Burnham Lateral West, water would enter a pipeline to be released into a stabilized natural channel to flow into Upper

Cottonwood Reservoir.

Assuming NIIP facilities are available for an extended operating season, a storage reservoir with an active capacity of at least 8,800 acre-feet is needed. The size of the reservoir is dependent on the GNPP demand for the November 1 through February 28 period. During August, less than the average capacity can be delivered. The average capacity available for GNPP for the rest of the months must be increased to adjust for this shortfall.

Table 4 Delivery from Burnham Lateral West - Extended Irrigation Season

Month	Days Available to Supply GNPP	NAPI Demand of Peak Capacity (%) (1)	NAPI Demand in Burnham Lateral West (cfs)	Average Capacity Required for GNPP (cfs)	Acre-feet Supplied to GNPP	Acre-feet Demand by GNPP (2)	Cumulative Storage Volume Required by GNPP (acre-feet)
Jan	0	0	0	0	0	2000	-2000
Feb	0	0	0	0	0	2000	-4000
Mar	31	0	0	74.8	4599	2200	-1601
April	30	25	80.0	74.8	4451	2400	450
May	31	55	176.0	74.8	4599	2600	2449
June	30	75	240.0	74.8	4451	3000	3900
July	0	100	320.0	0	0	3315	585
Aug	31	82	262.0	(3) 58.0	3566	3000	1151
Sept	30	50	160.0	74.8	4451	2800	2801
Oct	31	17	54.0	74.8	4598	2600	4800
Nov	0	0	0	0	0	2400	2400
Dec	0	0	0	0	0	2400	0
TOTALS					30715	30715	8800 (4)

- (1) Assumes July supplies NAPI peak demand only. All other months are assumed NAPI demand as a percentage of peak.
- (2) GNPP monthly demand distribution is based on Gallup NM 1994 water use.
- (3) 58 cfs is the maximum amount available in August due to NAPI's demand and the limiting capacity of Burnham Lateral West.

- (4) Required active storage is sum of the absolute value of largest negative storage volume and largest positive storage volume ( $|-4000|+4800= 8800$ )

All Year Operating Season - To supply GNPP 30,715 acre-feet from January 1 to December 31 each year, a daily average volume of 94 acre-feet (47.61 cfs) is required. This volume must be conveyed in a 334 day operating season.

Table 5 shows an example operating plan using Amarillo Canal to carry water to Lower Cottonwood Reservoir. Assuming NIIP facilities are modified to allow all year operation, a storage reservoir with an active capacity of at least 4,379 acre-feet is needed. The size of the reservoir is dependent on GNPP demand for the month of July when NIIP facilities have no additional capacity for GNPP and on the seasonal variations in GNPP demand. During the month of August, less than the average capacity can be delivered. The average capacity available for GNPP for the rest of the months must be increased to adjust for this shortfall.

Table 5 Delivery from Amarillo Canal - January 1 through December 31

Month	Days Available to Supply GNPP	NAPI Demand of Peak Capacity (%) (1)	NAPI Demand in Amarillo Canal (cfs)	Average Capacity Required for GNPP (cfs)	Acre-feet Supplied to GNPP	Acre-feet Demand by GNPP (2)	Cumulative Storage Volume Required by GNPP (acre-feet)
Jan	31	0.00	0.00	47.6	2927	2000	927
Feb	28	0.00	0.00	47.6	2644	2000	1571
Mar	31	0.00	0.00	47.6	2927	2200	2,298
April	30	25	47.5	47.6	2833	2400	2,731
May	31	55	104.5	47.6	2927	2600	3,058
June	30	75	142.5	47.6	2833	3000	2891
July	0.00	100	190	0.00	0.00	3315	-424
Aug	31	82	155.8	(3) 34.2	2103	3000	-1321
Sept	30	50	95	47.6	2833	2800	-1288
Oct	31	17	32.3	47.6	2927	2600	-961
Nov	30	0.00	0.00	47.6	2833	2400	-528
Dec	31	0.00	0.00	47.6	2928	2400	0.00
TOTALS					30715	30715	4379 (4)

- (1) Assumes July supplies NAPI peak demand only. All other months are assumed NAPI demand as a percentage of peak.
- (2) GNPP monthly demand distribution is based on Gallup NM 1994 water use.
- (3) 34.2 cfs is the maximum amount available in August due to NAPI's demand and the limiting capacity of Amarillo Canal.
- (4) Required active storage is sum of the absolute value of largest negative storage volume and largest positive storage volume ( $| -1321 | + 3058 = 4379$ )

Operating the canals during the winter has potential for mechanical equipment damage when freeze conditions exist. Heaters and air bubblers would need to be installed at checks to protect the equipment. It is estimated to install this equipment at all required locations would cost \$360,000. Delivery turnouts to pumping plants and laterals would need a positive seal to stop water from entering these facilities during the winter. It is estimates that it would cost \$95,000 to install this equipment.

The Appendix contains the cost estimate for installation of heating and bubbler equipment at the checks and equipment to seal all turnouts.

## 2. Navajo Reservoir to Moncisco Reservoir Pipeline

This option would deliver 42 cfs in a pipeline from Navajo Reservoir to the proposed Moncisco Reservoir. The Moncisco site is the closest reservoir site to Navajo Reservoir and is discussed further in section E. It would require the construction of a diversion structure from the San Juan River below Navajo Dam, pipeline, pumping plants, pipe outlet structure and appurtenant structures. This option would also require the construction of Moncisco Dam that has a storage volume of 1,849 acre-feet. Table 6 shows the calculations for the needed storage volume. The dam would be the initial water storage facility for GNPP. The pipeline alignment follows the San Juan River from the base of Navajo Dam to the confluence with Gallegos Canyon. The alignment then follows Gallegos Canyon to the proposed Moncisco Reservoir for a total pipeline length of approximately 245,000 feet. The river alignment was selected over a more direct route which would cross extremely rough canyons and mesa tops. Three pumping plants were used for estimating purposes to lift the water from the San Juan River valley to the Moncisco Reservoir. The location of the proposed pipeline is shown on drawing 1695-529-4.

Moncisco Dam as envisioned in this option would have the primary function as establishing a storage reservoir for the GNPP.

No geologic review was performed. For estimating purposes only, it is assumed that 20 percent of the pipeline trench would be located in rock excavation. The remaining 80 percent is assumed to be common excavation.

Pumping plants are needed to lift the water from the San Juan River valley to Moncisco Reservoir. The estimate is for three pumping plants based on minimizing cost for pumps and motors. More detailed investigations may indicate that additional or fewer pumping plants are required to achieve the lowest total cost. The pumping plants were assumed to run continuously. Spare pumps would enable the system to continue to operate during maintenance outages. The costs included for the pumping plants include structural improvements, water-ways, pumps, motors, accessory electrical equipment, miscellaneous equipment, and switchyards.

The greatest number of pipe material and type options should be considered to obtain the lowest cost. Likely pipe options would require corrosion protection and would add to the cost of the project. No allowances for corrosion protection are included in the estimate. Appurtenant structures such as air valves, blowoffs, manholes, flowmeters, and sectionalizing valves are included in the amount for unlisted items. An inlet structure from the San Juan River is needed downstream of Navajo Dam. An outlet structure is required at the end of the pipeline at Moncisco Reservoir. Costs for these structures were included.

The estimate to construct the pipeline and three pumping plants is \$77,450,000. The estimate to construct Moncisco Dam, spillway, and outlet works is \$18,996,000. The estimate to construct powerlines to the pumping plants is \$300,000. These includes 5 percent for unlisted items and 20 percent for contingencies. The estimated costs for relocation of existing utilities and mitigation of archeological sites is \$10,500,000. The total estimated cost for construction of the pipeline and pumping plants, dam, power lines, and for relocation of utilities and archeological mitigation is \$107,246,000.

The estimated annual energy cost to pump water through three pumping plants is \$308,000. This cost is based on pumping water 365 days a year.

The Appendix contains the cost estimate for the pipeline and pumping plants and the 1,850 acre-feet Moncisco Dam.

### 3. San Juan River to Moncisco Reservoir Pipeline

This option would deliver 42 cfs in a pipeline from the San Juan River near Farmington to the proposed Moncisco Reservoir. The Moncisco site is the closest reservoir site to Navajo Reservoir and is discussed further in section E. It would require the construction of a diversion structure from the San Juan River, a pipeline, pumping plants, a pipeline outlet structure and appurtenant structures. This option would also require the construction of Moncisco Dam that has a storage volume of 1,849 acre-feet. Table 6 shows the calculations for the needed storage volume. The dam would be the initial water storage facility for GNPP. The point of diversion from the San Juan River would be approximately 3000 feet upstream of the confluence of the San Juan with the Animas River. The pipeline alignment would rise from the San Juan River valley to the top of the mesa and proceed in a southeast direction to the proposed Moncisco Reservoir site. The length of the pipeline is approximately 86,000 feet. The location of the proposed pipeline is shown on drawing 1695-529-5.

Moncisco Dam as envisioned in this option would have the primary function as establishing a storage reservoir for the GNPP.

No geologic review was performed. For estimating purposes only, it is assumed that 20 percent of the pipeline trench would be located in rock excavation. The remaining 80 percent is assumed to be common excavation.

Pumping plants are needed to lift the water from the San Juan River to Moncisco Reservoir. The estimate is for three pumping plants. More detailed investigations may indicate that additional or fewer pumping plants are required to achieve the lowest total cost. The pumping plants were assumed to run continuously. Spare pumps would enable the system to continue to operate during maintenance outages. The costs included for the pumping plants include structural improvements, water-ways, pumps, motors, accessory electrical equipment, miscellaneous equipment, and switchyards.

The greatest number of pipe material and type options should be considered to obtain the lowest cost. Likely pipe options would require corrosion protection and would add to the cost of the project. No allowances for corrosion protection are included in the estimate. Appurtenant structures such as air valves, blowoffs, manholes, flowmeters, and sectionalizing valves are included in the amount for unlisted items. An outlet structure is required at the end of the pipeline at Moncisco Reservoir. Costs for these structures were included.

The estimate to construct the pipeline and three pumping plants is \$34,100,000. The estimate to construct Moncisco Dam, spillway, and outlet works is \$18,996,000. The estimate to construct power lines to the pumping plants is \$300,000. These includes 5 percent for unlisted items and 20 percent for contingencies. The estimated costs for relocation of existing utilities and mitigation of archeological sites is \$4,500,000. The total estimated cost construction of the pipeline and pumping plants, dam, power lines, and for relocation of utilities and archeological mitigation is \$57,896,000.

The estimated annual energy cost to pump water through three pumping plants is \$414,000. This cost is based on pumping water 365 days a year.

The Appendix contains the cost estimate for the pipeline and pumping plants and the 1,850 acre-feet dam.

Table 6 Delivery from San Juan River or Navajo Reservoir to Moncisco Reservoir January 1 through December 31

Month	Average Capacity Required for GNPP (cfs)	Acre-feet Supplied to Moncisco Reservoir	Acre-feet Demand by GNPP (1)	Cumulative Storage Volume Required by GNPP (acre-feet)
Jan	42.4	2609	2000	609
Feb	42.4	2356	2000	965
Mar	42.4	2609	2200	1374
April	42.4	2524	2400	1498
May	42.4	2609	2600	1507
June	42.4	2524	3000	1031
July	42.4	2609	3315	325
Aug	42.4	2609	3000	-66
Sept	42.4	2524	2800	-342
Oct	42.4	2609	2600	-333
Nov	42.4	2524	2400	-209
Dec	42.4	2609	2400	0
TOTALS		30715	30715	1849 (2)

- (1) GNPP monthly demands based on Gallup NM current usage.
- (2) Storage required is sum of the absolute value of largest negative storage volume and largest positive storage volume ( $-342+1507=1849$ ).

E. STORAGE RESERVOIR OPTIONS FOR GNPP

1. General - A storage reservoir is needed to supply water to GNPP during periods when NIIP facilities are not available. Two sites in Hunter Wash, two sites in Pinabete Arroyo, two sites in an unnamed tributary to Cottonwood Arroyo, and a site in Moncisco Wash were reviewed. Of the above sites, only the Moncisco site and the two sites in the unnamed tributary to Cottonwood Arroyo appear to be feasible. Since storage is not necessary for NIIP irrigation, the sites would have the primary function as establishing a storage reservoir for GNPP.

Moncisco Dam - Moncisco Wash provides a storage reservoir site for three of the water supply options to serve GNPP. One option would require the construction of a dam to provide approximately 8,800 acre-feet active storage for an extended irrigation season and use of NIIP facilities. The Reconnaissance Design Summary [6] prepared by the Bureau of Reclamation in February, 1995 investigated a dam of approximately this size. The second and third options would require construction of a dam to provide approximately 1,850 acre-feet active storage for either the Navajo Reservoir to Moncisco Reservoir or the San Juan River to Moncisco Reservoir pipelines.

The water supply options require the construction of the dam, spillway, outlet works, and stabilization of a natural channel for filling purposes. The proposed dam site is located approximately 16 miles south of Farmington, New Mexico in Moncisco Wash. The location of the proposed dam is shown on drawing 1695-529-1. The reservoir would be filled by pumping water from Gravity Main Canal through the Gallegos Pumping Plant into Burnham Lateral. From Burnham Lateral water would be released into Moncisco Wash upstream of the dam. Gallegos Pumping Plant and Burnham Laterals are features of NIIP and are under construction.

The site is accessible from a paved county road and unimproved dirt roads.

Subsurface geologic data was not collected for the Moncisco Wash dam site. Limited surface geologic mapping and previous exploration for Gallegos dam site indicate that foundation conditions are as good or better than those at Gallegos

dam site. The site lies in the Ojo Alamo Formation comprised predominantly of sandstone. Limited testing of potential construction materials have been performed.

The Reconnaissance Design Summary considered two embankment options. One option had a central earth core as the impermeable barrier. The other option had a central cutoff wall. Embankment slopes of 3:1 (H:V) upstream and downstream appeared reasonable for the silty sands likely used as embankment material. The silty sands at the site are suitable for manufacturing soil cement and therefore chosen for slope protection in lieu of riprap.

Two spillway options were considered. A 100 foot wide concrete spillway structure located on the dam crest and downstream embankment was one option. The other option was a dam sized to store the entire local probable maximum flood storm. For this report, only the dam design with the 100 foot spillway will be considered. The concrete spillway would consist of a crest structure with an uncontrolled ogee crest at the top of the active conservation pool, concrete chute down the downstream embankment, and a concrete stilling basin. The channel downstream of the stilling basin would be riprap lined.

A smaller outlet works is considered in this report from that described in the Reconnaissance Design Summary due to the reservoir not having to provide NIIP peak irrigation demands.

The dam would be a zoned earthfill dam with a crest width of 30 feet. Two crest elevations were considered; 6040 and 6000. The crest elevation at 6040 would have a 100 foot wide concrete spillway and total active storage of approximately 10,255 acre-feet. With a crest elevation at 6000, the total active storage would be approximately 1,850 acre-feet.

The estimate to construct an earth core dam with crest elevation of 6040 and a 100 foot spillway is \$30,697,000. The estimate to stabilize the natural channel used for filling the reservoir is \$1,752,000. Costs for mitigation/relocation of the existing gas wells, pipelines, roads, powerlines, and archeological sites in the reservoir were estimated to be an additional \$3,100,000. The total estimated cost for construction of a dam to elevation 6040, stabilization of the natural channel for filling, and for relocation of utilities and archeological mitigation is \$35,549,000.

Sections D.2. and D.3. describe the total estimated costs for the Navajo Reservoir and San Juan River to Moncisco Reservoir pipeline water supply options with

Moncisco Dam constructed to crest elevation 6000.

The estimated annual energy cost to pump water through Gallegos Pumping Plant is \$160,000 per year.

The Appendix contains the cost estimates for both dam size options.

3. Upper Cottonwood Dam - The unnamed tributary to Cottonwood Arroyo provides a storage reservoir site for two of the water supply options to serve GNPP. One option would require the construction of a dam to provide approximately 8,800 acre-feet active storage for an extended irrigation season. The second option would require approximately 4,380 acre-feet of active storage for an all year operating season.

The above options require the construction of a dam, spillway, outlet works, filling pipeline, and channel stabilization. The proposed dam site is located approximately 17.5 miles southwest of Farmington, New Mexico in a unnamed tributary to Cottonwood Arroyo. The location of the proposed dam is shown on drawing 1695-529-2. The reservoir would be filled by pumping water from the Gravity Main Canal through the Gallegos Pumping Plant into Burnham Lateral West. From Burnham Lateral West, a pipeline and stabilized natural channel would deliver water to the reservoir. Burnham Lateral West is constructed and Gallegos Pumping Plant is under construction.

The site is accessible from New Mexico State Highway 371, BIA roads 3003 and 4085, and unimproved dirt roads.

The area of the proposed dam and reservoir is generally rolling to gently sloping with deeply incised, steep sided, flat bottomed, washes and gullies. The washes flow intermittently during times of precipitation. The site lies in the Farmington Sandstone member of the Kirtland Formation but specific site geology data has not been collected. Tests on potential construction materials in the vicinity of the proposed dam were not conducted. A site specific data collection program should be conducted should a more detailed design study be considered.

A zoned earth embankment with 3:1 (H:V) upstream and downstream slopes was used for this appraisal level evaluation. It was assumed that suitable impermeable material for a clay core is available within an economical hauling distance. Zones of processed sand filter and gravel drain material were included in the estimate to protect against piping of embankment and foundation material and to provide

drainage of the embankment. Processed filter and gravel material would likely be obtained from commercial sources in Farmington, New Mexico. Rock is observed in the bottom of the arroyo and on the abutments. It is anticipated that all surface material overlying the rock would be removed to provide a suitable foundation. Soil cement was considered as slope protection in lieu of rock riprap. On the upstream face, a 10-foot horizontal width of soil cement would protect against wave action and on the downstream face a 1-foot perpendicular to slope width would protect the slope from erosion.

The runoff from a 100 year, 24 hour storm would produce a peak discharge of 2100 cfs. A 50-foot wide concrete spillway was used for estimating costs. The concrete spillway would consist of a crest structure with an uncontrolled ogee crest at the top of the active conservation pool, a concrete chute down the downstream embankment, and a concrete stilling basin. The channel downstream of the stilling basin would be riprap lined.

The outlet works would be an intake structure with trashracks, a 30-inch diameter upstream pipe, a high pressure gate located in a gate chamber near the center of the dam, a 30-inch diameter downstream pipe located in a concrete horseshoe conduit, a downstream high pressure gate, and a impact type energy dissipator. Access to the gate chamber would be through the horseshoe conduit.

The larger of the proposed dams would be 90 feet in height at maximum section with a crest length of 4330 feet. The crest width would be 30 feet. The maximum feasible crest elevation is approximately 5910 with the top of active conservation pool at 5900. The drainage area above the dam is 7.6 square miles. At 5900 feet elevation the surface area of the reservoir would be approximately 340 acres with maximum storage capacity of 10,800 acre-feet. Active storage would be approximately 8,800 acre-feet after reducing the volume for sediment deposition (100 year), evaporation loss, and seepage loss.

The estimate to construct an earth core dam with spillway and outlet works to crest elevation of 5910 is \$25,046,000. The estimate to construct a pipeline from Burnham Lateral West to the natural channel and to stabilize the channel is \$6,995,000. Costs for mitigation/relocation of the existing utilities and archeological sites in the reservoir basin are estimated to be \$500,000. The total estimated construction cost is \$32,541,000.

The estimate to construct a smaller earth core dam with spillway and outlet works to crest elevation of 5885 is \$14,570,000. The estimate to construct a pipeline

from Burnham Lateral West to the natural channel and to stabilize the channel is \$6,995,000. Costs for mitigation/relocation of the existing utilities and archeological sites in the reservoir basin are estimated to be \$500,000. The total estimated construction cost is \$22,065,000.

The estimated annual energy cost to pump water through Gallegos Pumping Plant to Burnham Lateral West for both dam sizes is \$160,000.

The Appendix contains the cost estimate for the dams, spillway, outlet works, pipeline from Burnham Lateral West, and channel stabilization.

4. Lower Cottonwood Dam - The unnamed tributary to Cottonwood Arroyo provides a storage reservoir site for three of the water supply options to serve GNPP. Two options would require the construction of a dam to provide approximately 11,000 acre-feet active storage for the normal irrigation season. The third option would require approximately 4,379 acre-feet of active storage for an all year operating season.

The above options require the construction of a dam, spillway, outlet works, filling pipeline, and channel stabilization for deliver from Burnham Lateral West. The proposed dam site is located approximately 17.5 miles southwest of Farmington, New Mexico in a unnamed tributary to Cottonwood Arroyo. This dam site is approximately a half mile downstream of the proposed Upper Cottonwood Dam site. The location of the proposed dam is shown on drawing 1695-529-3. The reservoir is located so that it is possible to fill the reservoir by two alternatives; gravity flow through a pipeline from Amarillo Canal, or by pumping through Gallegos Pumping Plant into Burnham Lateral West and then by pipeline into a stabilized natural channel.

The site is accessible from State Highway 371, BIA roads 3003 and 4085, and unimproved dirt roads.

The area of the proposed dam and reservoir is generally rolling to gently sloping with deeply incised, steep sided, flat bottomed, washes and gullies. The washes flow intermittently during times of precipitation. The site lies in the Farmington Sandstone member of the Kirtland Formations but specific site geology data has not been collected. Tests on potential construction materials in the vicinity of the proposed dam were not conducted. A site specific data collection program should be conducted should a more detailed design study be considered.

A zoned earth embankment with 3:1 (H:V) upstream and downstream slopes was used for this appraisal level evaluation. It was assumed that suitable impermeable material for a clay core is available within an economical hauling distance. Zones of processed sand filter and gravel drain material were included in the estimate to protect against piping of embankment and foundation material and to provide drainage of the embankment. Processed filter and gravel material would likely be obtained from commercial sources in Farmington, New Mexico. Rock is observed in the bottom of the arroyo and on the abutments. It is anticipated that all surface material over lying the rock would be removed to provide a suitable foundation. Soil cement was considered as slope protection in lieu of rock riprap. On the upstream face, a 10-foot horizontal width of soil cement would protect against wave action and on the downstream face a 1-foot perpendicular to slope width would protect the slope from erosion.

The runoff from a 100 year, 24 hour storm would produce a peak discharge of 3500 cfs. A 80-foot wide concrete spillway was used for estimating costs. The concrete spillway would consist of a crest structure with an uncontrolled ogee crest at the top of the active conservation pool, concrete chute down the downstream embankment, and a concrete stilling basin. The channel downstream of the stilling basin would be riprap lined.

The outlet works would be an intake structure with trashracks, a 30-inch diameter upstream conduit, a high pressure gate located in a gate chamber near the center of the dam, a 30-inch diameter downstream pipe located in a concrete horseshoe conduit, a downstream high pressure gate, and a impact type energy dissipator. Access to the gate chamber would be through the horseshoe conduit.

The larger of the proposed dams would be 120 feet in height at maximum section with a crest length of 2890 feet. The crest width would be 30 feet. The crest elevation is approximately 5850 with the top of active conservation pool at 5840. The drainage area above the dam is 13.4 square miles. At 5840 feet elevation the surface area of the reservoir would be approximately 336 acres with active storage capacity of 11,000 acre-feet.

The estimate to construct a dam to crest elevation at 5850 is \$31,768,000. The estimate to construct the pipeline from Amarillo Canal to the reservoir is \$5,752,000. The estimated costs for mitigation/relocation of archeological sites and existing utilities is \$500,000. The total estimated construction cost is \$38,020,000. Since filling would be by gravity through Amarillo Canal (Alternative 1 drawing 1695-529-3), a pumping annual energy cost is not

necessary.

Using the same dam size (crest elev 5850) and filling from Burnham Lateral West would change the total estimated cost to \$39,263,000. The estimated annual energy cost to pump water through Gallegos Pumping Plant to Burnham Lateral West (Alternative 2 drawing 1695-529-3) is \$160,000.

The estimate to construct a dam to crest elevation at 5825 is \$21,019,000. The estimate to construct the pipeline from Amarillo Canal to the reservoir is \$5,752,000. The estimated costs for mitigation/relocation of the archeological sites and existing utilities is \$500,000. The total estimated construction cost is \$27,271,000. Since filling would be by gravity through Amarillo Canal (Alternative 1 drawing 1695-529-3), a pumping annual energy cost is not necessary.

The Appendix contains the cost estimates for the dams, spillway, outlet works, and pipelines for the two filling alternatives.

#### F. SUMMARY

1. Water Supply Options for GNPP - Eight options were studied to supply water to GNPP. Six options involve use of the NIIP canal system and the other two are; a pipeline from Navajo Reservoir to Moncisco Reservoir, and a pipeline from the San Juan River to Moncisco Reservoir. The water supply options are:
  - Construct a dam at the Lower Cottonwood site to provide 11,000 acre-feet active storage. Fill the reservoir by a pipeline from Amarillo Canal. A normal irrigation season from April 1 to October 31 would be used to deliver water to the reservoir. Pumping is not required to fill the reservoir.
  - Construct a dam at the Lower Cottonwood site to provide 11,000 acre-feet active storage. Fill the reservoir by a pipeline from Burnham Lateral West. A normal irrigation season from April 1 to October 31 would be used to deliver water to the reservoir. Pumping of the water through Gallegos Pumping Plant would be required.
  - Construct a dam at the Upper Cottonwood site to provide 8,800 acre-feet active storage. Fill the reservoir by a pipeline from Burnham

Lateral West. An extended irrigation season from March 1 to October 31 would be used to deliver water to the reservoir. Pumping of the water through Gallegos Pumping Plant would be required.

- Construct a dam at the Moncisco Wash site to provide 8,800 acre-feet active storage. Fill the reservoir from Burnham Lateral. An extended irrigation season from March 1 to October 31 would be used to deliver water to the reservoir. Pumping of the water through Gallegos Pumping Plant would be required.
- Construct a dam at the Upper Cottonwood site to provide 4,380 acre-feet active storage. Fill the reservoir by a pipeline from Burnham Lateral West. A all year NIIP operating season would be used to deliver water to the reservoir. Pumping of the water through Gallegos Pumping Plant would be required.
- Construct a dam at the Lower Cottonwood site to provide 4,380 acre-feet active storage. Fill the reservoir by a pipeline from Amarillo Canal. A all year NIIP operating season would be used to deliver water to the reservoir. Pumping is not required to fill the reservoir.
- Construct a pipeline from below Navajo Dam to Moncisco Reservoir. This option would require the construction of a diversion structure from the San Juan River, pipeline, pumping plants, pipe outlet structure and appurtenant structures. It would also require the construction of Moncisco Dam, dam spillway, and outlet works. This option would not use any existing NIIP facilities. Pumping plants would be needed to lift the water from the San Juan River Basin to the reservoir site.
- Construct a pipeline from the San Juan River near Farmington to the proposed Moncisco Reservoir. It would require the construction of a diversion structure from the San Juan River, a pipeline, pumping plants, pipeline outlet structure and appurtenant structures. It would also require the construction of Moncisco Dam, dam spillway, and outlet works. This option would not use any existing NIIP facilities. Pumping plants would be needed to lift the water from the San Juan River Basin to the reservoir site.

2. Storage Reservoir Options for GNPP - A reservoir site in Moncisco Wash site and two sites in a unnamed tributary to Cottonwood Arroyo appear to be the only feasible sites. Since storage is not necessary for NIIP irrigation, the sites would have the primary function as establishing a storage reservoir for GNPP. The dams were evaluated as earth core dams with zones of filter and drain material with a concrete spillway and outlet works pipe. The upstream and downstream embankment slopes would be protected by soil cement.
- The Moncisco Wash site was reviewed at two crest elevations. At a crest elevation of 6040, the dam would provide the 8,800 acre-feet of storage needed for the extended operating season. At a crest elevation of 6000, the dam would provide the 1,850 acre-feet of storage needed for the all year operating season.
  - The Upper Cottonwood site was reviewed at two crest elevations. At a crest elevation of 5910, the dam would provide the 8,800 acre-feet of storage needed for the extended operating season. At a crest elevation of 5885, the dam would provide the 4,380 acre-feet of storage needed for the all year operating season.
  - The Lower Cottonwood site was reviewed at two crest elevations. At a crest elevation of 5850, the dam would provide the 11,000 acre-feet of storage needed for a normal operating season. At a crest elevation of 5825, the dam would provide the 4,380 acre-feet of storage needed for the all year operating season.

Table 7 below summarizes the water supply options evaluated, required storage, construction cost, an annual power costs.

Table 7 Summary of GNPP Water Supply Options

Options	Required Storage (AF)	Construction Cost	Annual Power Cost
Lower Cottonwood (Amarillo Canal) Normal Season	11,000	\$38,020,000	\$0.00
Lower Cottonwood (Burnham Lateral West) Normal Season	11,000	\$39,263,000	\$160,000
Upper Cottonwood Extended Season	8,800	\$32,541,000	\$160,000
Moncisco Dam Extended Season	8,800	\$35,549,000	\$160,000
Upper Cottonwood All Year	4,380	\$22,065,000	\$160,000
Lower Cottonwood (Amarillo Canal) All Year	4,380	\$27,271,000	\$0.00
Navajo Reservoir to Moncisco Reservoir Pipeline	1,850	\$107,247,000	\$308,000
San Juan River to Moncisco Reservoir Pipeline	1,850	\$57,896,000	\$414,000

3. Construction Costs

The cost estimates contained in the appendix are appraisal level estimates and are made to explore potential alternatives to supply water to GNPP. The estimates are based on general information, United States Geological quadrangle maps, costs extracted from similar projects, Bureau of Reclamation computer estimating programs and estimating aids such as the Bureau of Reclamation's estimating manual.

Five percent was added for unlisted items and 20 percent to cover contingencies such as overruns on quantities, changed site conditions, and change orders. The

cost for mobilization was determined by adding 5 percent of the construction items.

CRSP power rates were used to develop the yearly energy cost for pumping. The demand rate used was \$3.54/KW/MO and the energy charge was \$0.008/KWH. If CRSP power is not available, it is anticipated that power could be obtained from a power marketer with comparable rates.

Non-contract costs were not added to the estimates. These cost would cover such items as planning, investigations, design and specifications, contract administration, environmental permits, and right-of-way. The total cost for these elements is usually between 20 to 30 percent of total construction cost of a contract.

## G. CONCLUSIONS

- Water supply options using NIIP facilities are more economical than options not using NIIP. Of the two non-NIIP options, a water supply from the San Juan River near Farmington is more economical than a pipeline from Navajo Reservoir. It would also be less environmentally damaging to the river valley and the trout fishery.
- There are three potential delivery points to obtain water from NIIP: Burnham Lateral, Burnham Lateral West, and the Amarillo Canal.
- GNPP reservoir storage is the most expensive component of NIIP water supply options. Therefore it is desirable to minimize the reservoir size.
- A longer NIIP operating season to supply GNPP will decrease initial GNPP storage needs.
- There would be little or no impact to NIIP to provide water during the normal irrigation season (April 1 to October 31) other than some additional O&M due to operating at higher capacity.
- An extended operating season (March 1 to October 31) would impact NIIP by reducing the time available for canal maintenance. Some additional O&M could be expected due to severe freezing weather which could damage equipment.

- An all year operating season (January 1 to December 31) appears to be potentially the least expensive. However this operating season would have an adverse impact on NIIP operations due to eliminating off-season maintenance. The canal O&M costs are expected to increase substantially. Additional data is required to determine if all year operation is feasible.
- The most feasible option based on existing information appears to be delivery of water to an Upper Cottonwood Reservoir through an extended operating season. The all year operation option using Upper Cottonwood Reservoir should also be investigated further.

## REFERENCES

[1] "Engineering and Cost Estimates Technical Appraisal Report", San Juan River Gallup/Navajo Water Supply Project, U.S. Bureau of Reclamation, November 1993.

[2] "Navajo Indian Irrigation Project, Gallegos Reservoir Needs and Cost Assessment", Keller-Bliesner Engineering, May 1995.

[3] "Reconnaissance Report", Gallup Project, U.S. Bureau of Reclamation, November 1972.

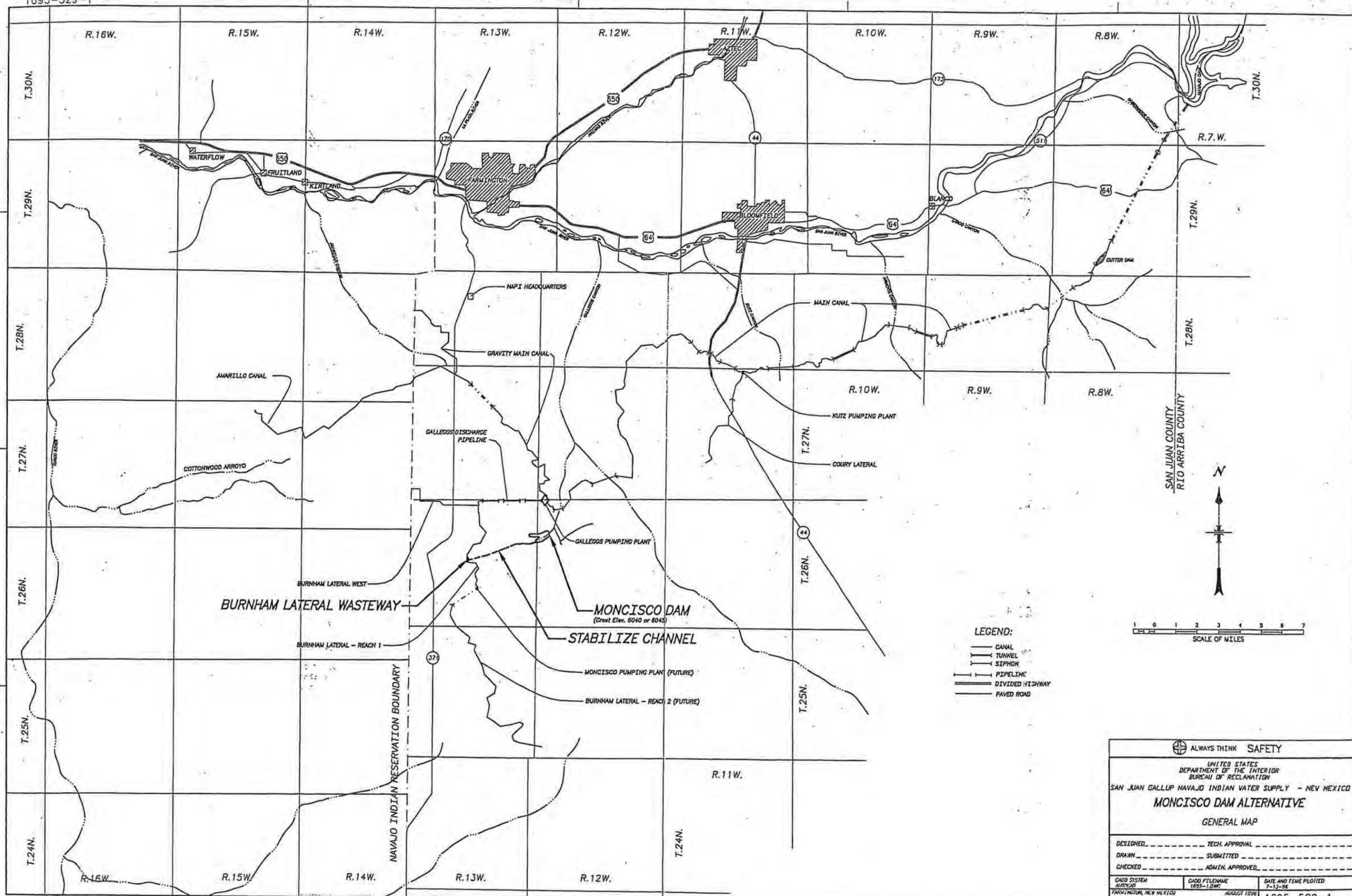
[4] "Part I Planning Report, Part II Draft Environmental Statement", Gallup- Navajo Indian Water Supply Project, U.S. Bureau of Reclamation, Southwest Regional Office, Amarillo, Texas, January 1984.

[5] "Technical Report", Gallup - Navajo Indian Water Supply Project, U.S. Bureau of Reclamation, Southwest Regional Office, Amarillo, Texas, September 1986.

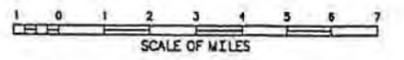
[6] "Gallegos Dam Reconnaissance Design Summary", U.S. Bureau of Reclamation, Technical Memorandum No. GG-8311-2, February 1995.

[7] "Gallup - Navajo Indian Water Supply Project", San Juan County, New Mexico, Department of Interior, September, 1981.

DRAWINGS



- LEGEND:**
- CANAL
  - TUNNEL
  - SIPHON
  - PIPELINE
  - DIVIDED HIGHWAY
  - PAVED ROAD



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UNITED STATES  
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BUREAU OF RECLAMATION

SAN JUAN GALLUP NAVAJO INDIAN WATER SUPPLY - NEW MEXICO

**MONCISCO DAM ALTERNATIVE**

GENERAL MAP

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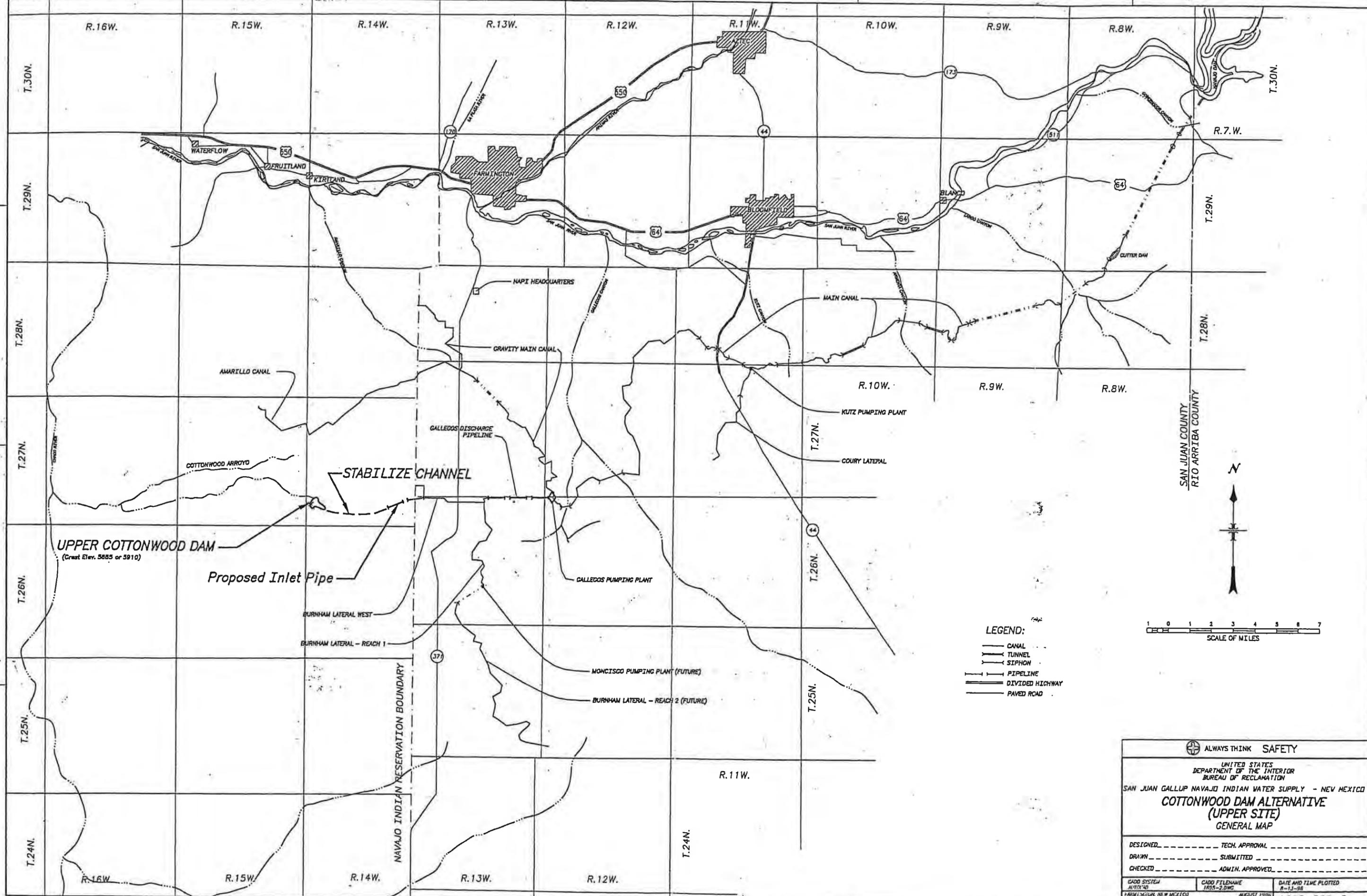
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FARMINGTON, NEW MEXICO		AUGUST 1996

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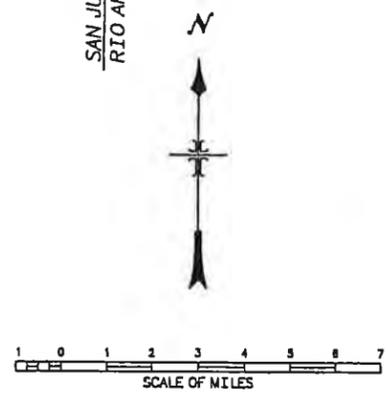


**UPPER COTTONWOOD DAM**  
(Crest Elev. 5885 or 5910)

*Proposed Inlet Pipe*

*STABILIZE CHANNEL*

- LEGEND:**
- CANAL
  - TUNNEL
  - SIPHON
  - PIPELINE
  - DIVIDED HIGHWAY
  - PAVED ROAD



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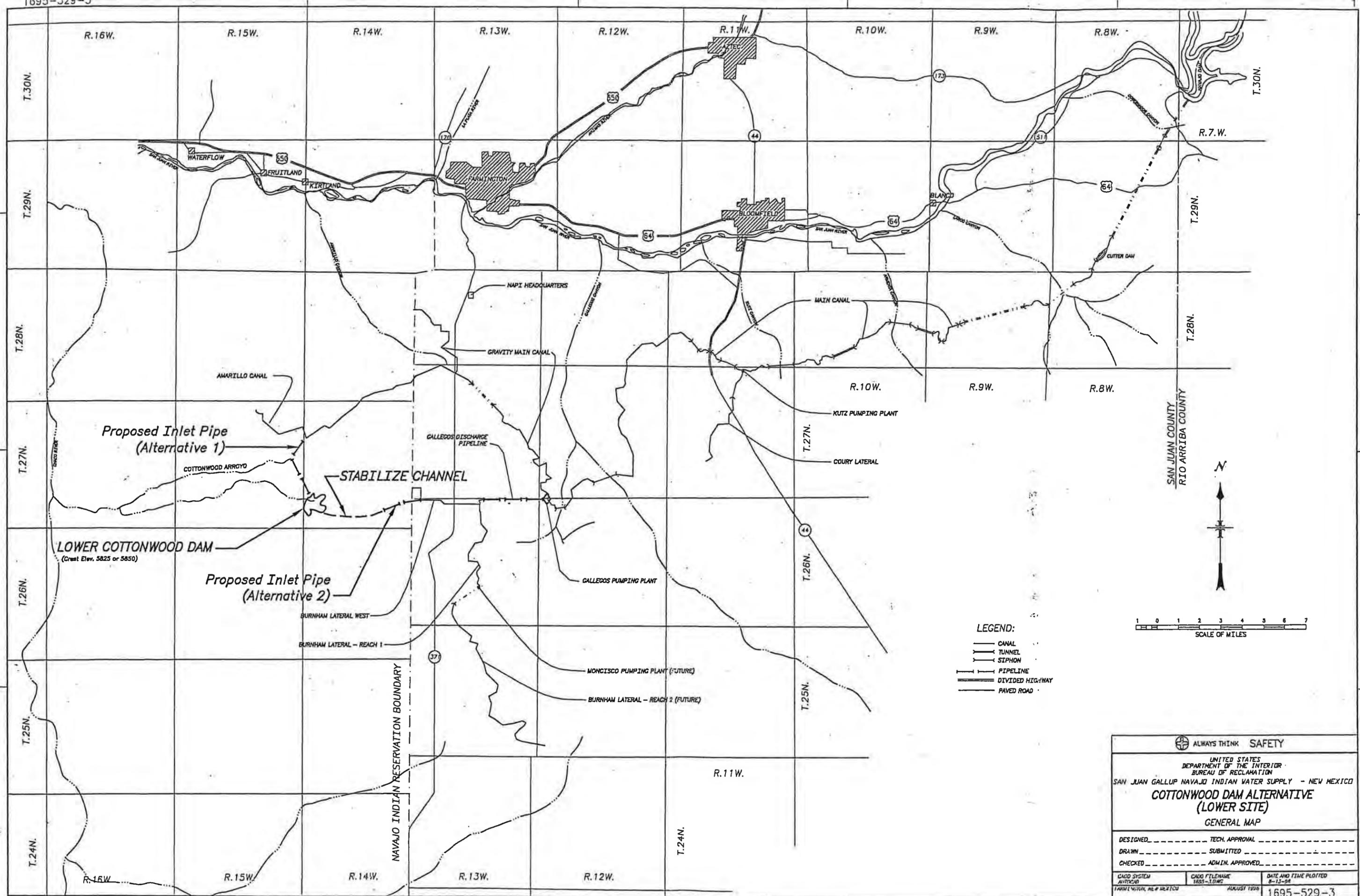
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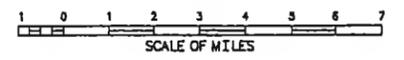
**COTTONWOOD DAM ALTERNATIVE  
(UPPER SITE)  
GENERAL MAP**

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FARMINGTON, NEW MEXICO		AUGUST 1998
1695-529-2		

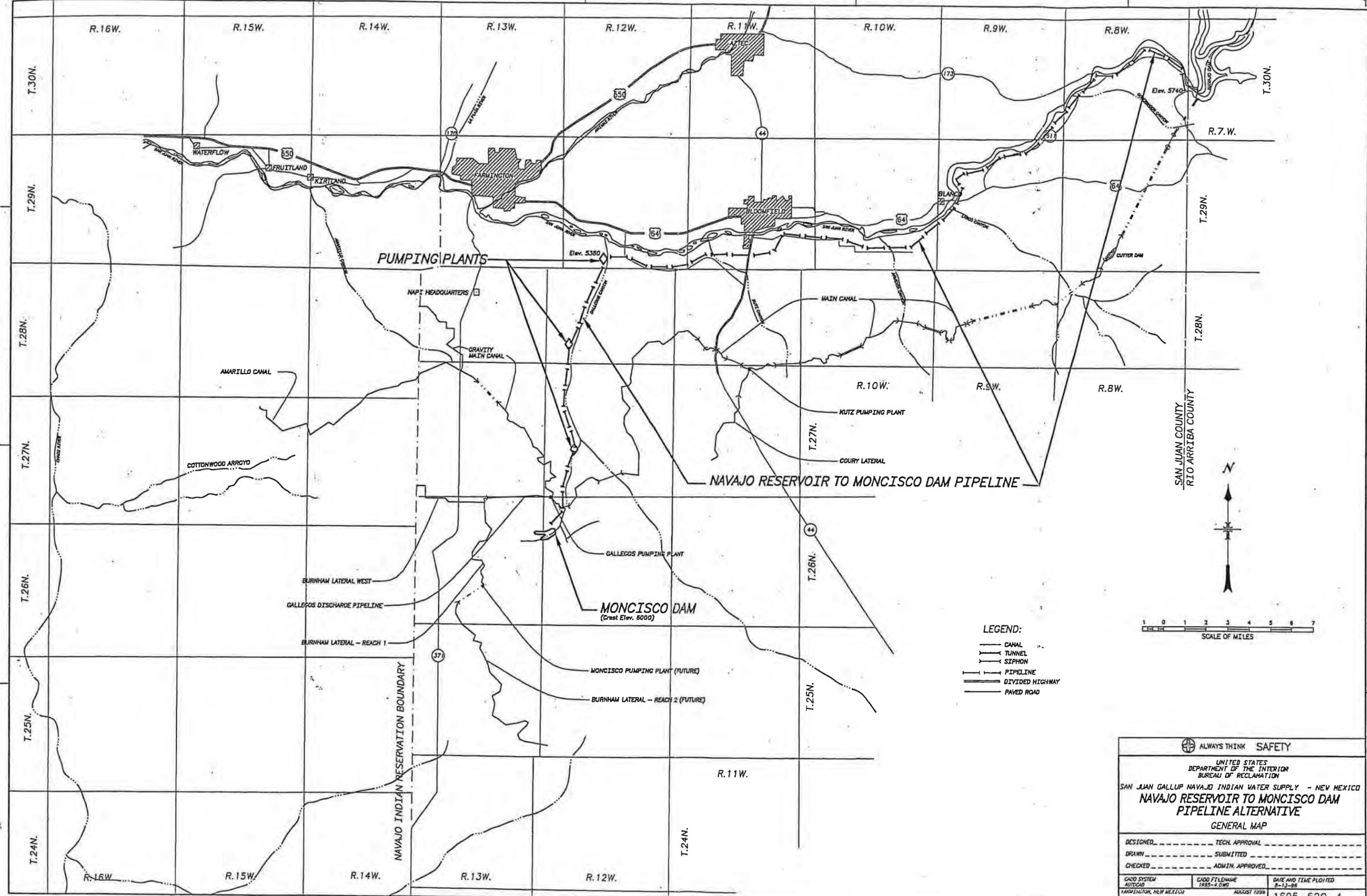


SAN JUAN COUNTY  
RIO ARRIBA COUNTY



- LEGEND:**
- CANAL
  - TUNNEL
  - SIPHON
  - PIPELINE
  - DIVIDED HIGHWAY
  - PAVED ROAD

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UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION SAN JUAN GALLUP NAVAJO INDIAN WATER SUPPLY - NEW MEXICO <b>COTTONWOOD DAM ALTERNATIVE          (LOWER SITE)</b> GENERAL MAP		
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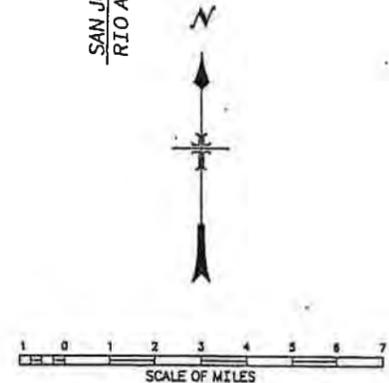


PUMPING PLANTS

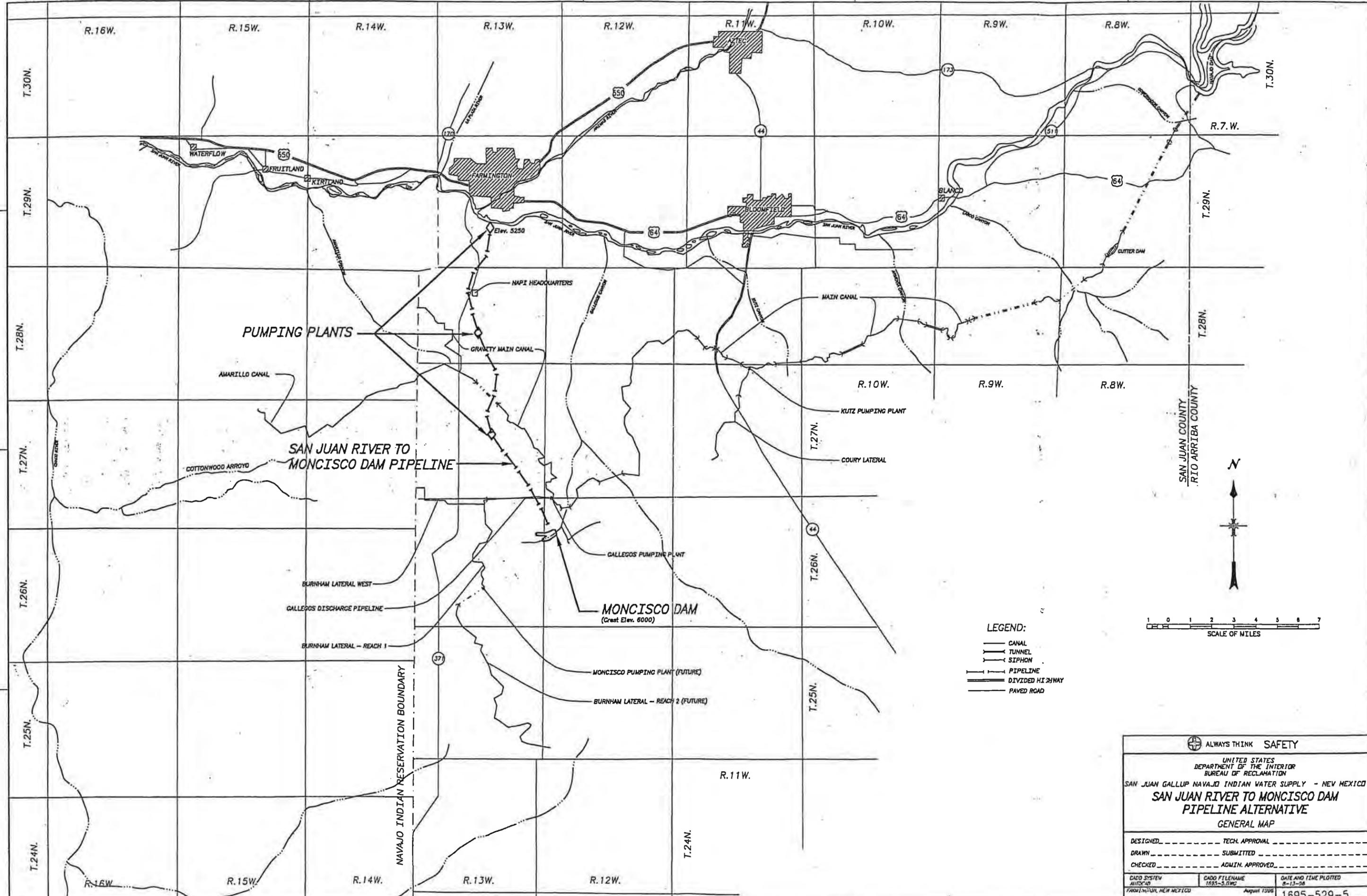
NAVAJO RESERVOIR TO MONCISCO DAM PIPELINE

MONCISCO DAM  
(Crest Elev. 8000)

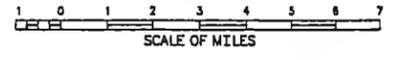
- LEGEND:**
- CANAL
  - TUNNEL
  - SIPHON
  - PIPELINE
  - DIVIDED HIGHWAY
  - PAVED ROAD



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UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION		
SAN JUAN GALLUP NAVAJO INDIAN WATER SUPPLY - NEW MEXICO <b>NAVAJO RESERVOIR TO MONCISCO DAM          PIPELINE ALTERNATIVE</b> GENERAL MAP		
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FARMINGTON, NEW MEXICO		AUGUST 1998
1695-529-4		



- LEGEND:**
- CANAL
  - TUNNEL
  - SIPHON
  - PIPELINE
  - DIVIDED HIGHWAY
  - PAVED ROAD



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SAN JUAN GALLUP NAVAJO INDIAN WATER SUPPLY - NEW MEXICO  
**SAN JUAN RIVER TO MONCISCO DAM  
 PIPELINE ALTERNATIVE**  
 GENERAL MAP

DESIGNED _____	TECH. APPROVAL _____	
DRAWN _____	SUBMITTED _____	
CHECKED _____	ADMIN. APPROVED _____	

CADD SYSTEM AUTOCAD	CADD FILENAME 1695-5.DWG	DATE AND TIME PLOTTED 8-13-98
FARMINGTON, NEW MEXICO	August 1998	1695-529-5

APPENDIX































NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix H**

**NAVAJO INDIAN IRRIGATION PROJECT**  
**Gallegos Reservoir Needs and Cost Assessment**  
**Keller Bleisner Engineering**  
**1995**

**NAVAJO INDIAN IRRIGATION PROJECT  
GALLEGOS RESERVOIR NEEDS AND COST ASSESSMENT**

**Prepared for**

**Bureau of Indian Affairs  
Navajo Indian Irrigation Project Office  
Farmington, New Mexico**

**and**

**Bureau of Reclamation  
Farmington Construction Office  
Farmington, New Mexico**

**by**

**Keller-Bliesner Engineering  
78 East Center  
Logan, Utah**

**May 30, 1995**

## NAVAJO INDIAN IRRIGATION PROJECT GALLEGOS RESERVOIR NEEDS AND COST ASSESSMENT

### Background

Gallegos Reservoir was a feature of the originally proposed Navajo Indian Irrigation Project when designed for surface irrigation. The design capacity of the system was computed to be 2,100 cfs during peak use, with 300 cfs coming from Gallegos Reservoir for an 11-day peak period. In 1973 the project was redesigned as an all-sprinkler project. The Bureau of Reclamation (BOR) and Indian Affairs (BIA) issued a joint report in November 1973 (revised March 1974) titled "All-Sprinkler Irrigation System," listing the design capacity of the canal system at 1,800 cfs, including seepage losses, eliminating the need for Gallegos Reservoir. The Environmental Impact Statement (EIS) was completed in 1976 based on this design capacity without Gallegos Reservoir included.

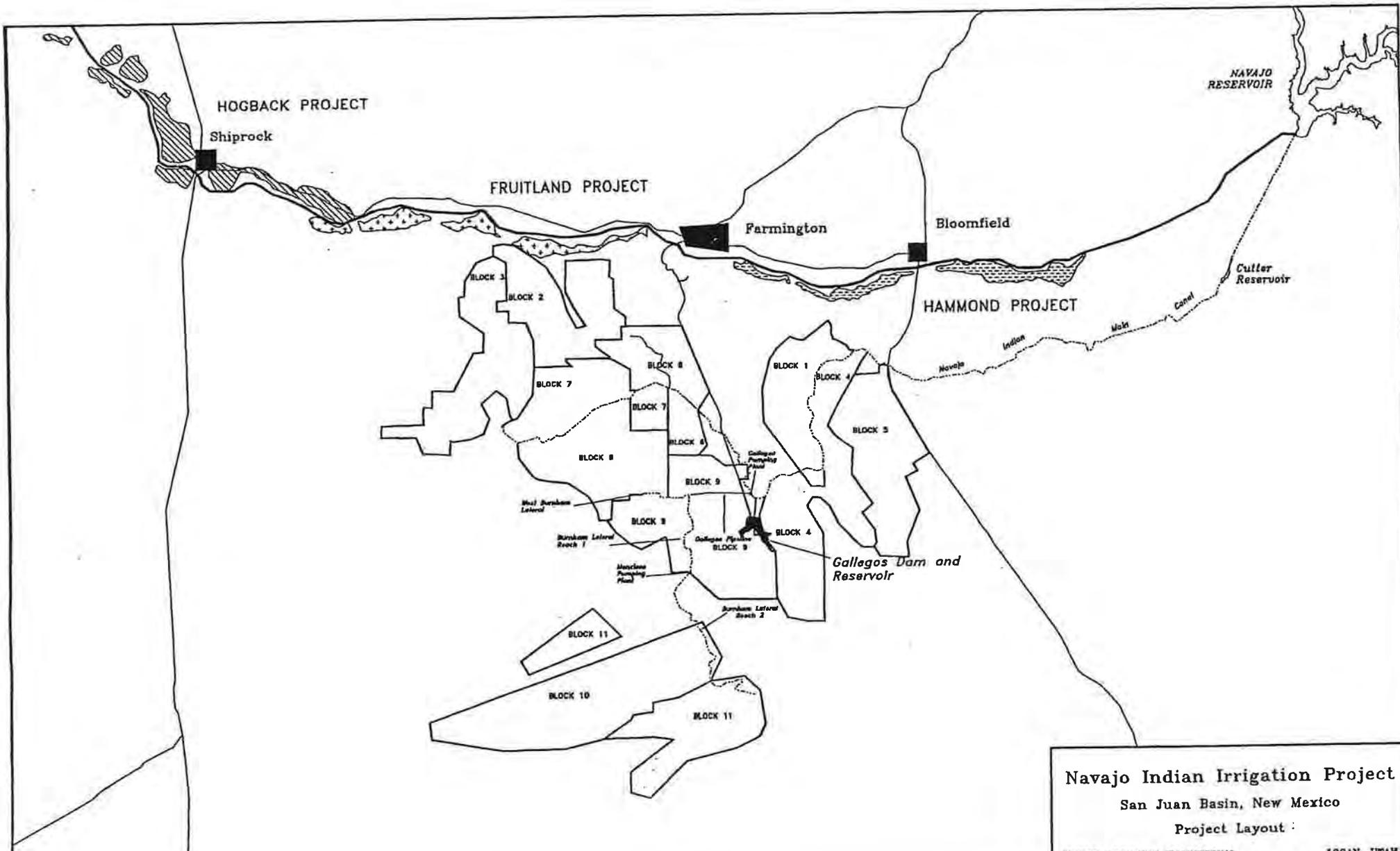
In 1978 BIA requested that the project be designed to divert the original 508,000 acre feet, with 119,400 acre feet delivered in July and to design the delivery system to meet a peak consumptive use demand of 0.4 inches per day. In November 1981, after three years of consumptive use and system capacity studies, BIA and BOR concurred in the design criteria to deliver 9.0 gpm per acre for 11 consecutive days on a net irrigated land base of 102,735 acres when allowing for roads, canals, drains, etc.

In 1983 BOR completed the four-year consumptive use study and determined that an annual diversion of 376,000 acre feet was required. BIA did not concur in the results of the study, maintaining that 508,000 acre feet was the required diversion. Later in 1983 BOR made the decision to design Gallegos Reservoir to deliver 9 gpm per acre (to the reduced acreage) for 15 days. Gallegos Reservoir was added as a project feature with an operational storage requirement of 7,735 acre feet, plus evaporation, seepage, sediment and dead storage requirements. Outlet works capacity was set at 260 cfs, providing a total capacity of 2,060 cfs for the system.

Since Gallegos Reservoir was not a project feature at the time the EIS was completed, a supplemental EIS is required before construction can proceed. Keller-Bliesner Engineering was contacted in January, 1994 to begin the preparation for NEPA compliance. The first step is to complete needs assessment for the proposed action, since a no-action alternative must be examined. This report has been prepared, with the assistance of BIA and BOR, to analyze the impact to NIIP from elimination of Gallegos Reservoir as the foundation of the no-action alternative.

### Gallegos Reservoir Analysis

A reconnaissance design was completed by BOR for Gallegos Dam in February 1995. The design alternatives and costs were summarized in Technical Memorandum No. GG-8311-2, Gallegos Dam Reconnaissance Design Summary, February 16, 1995, a publication of the BOR Technical Service Center in Denver, Colorado. Gallegos Dam is located approximately 15 miles south of Farmington, New Mexico. Figure 1 shows the general location. Since gas wells and pipelines within the reservoir area of the original dam site, a second site, on Moncisco Wash was analyzed. The Gallegos site is located on the west fork of Gallegos wash approximately 1,800 ft downstream of the confluence with Moncisco Wash. The Moncisco site is located approximately 4,200 feet upstream of the confluence with the west fork of Gallegos Canyon. The Gallegos site is located about 500 ft downstream of the originally proposed site to avoid foundation problems discovered during foundation investigation.



Navajo Indian Irrigation Project  
 San Juan Basin, New Mexico  
 Project Layout

KELLER-BLIESNER ENGINEERING      LOGAN, UTAH  
 Drawn by: GCH    Designed by: RDB    10/28/81    Sheet 1 of 1

Figure 1. Gallegos Reservoir Location Map

Storage requirements for each site are shown in Table 1. The operational storage is the same for both sites. The only difference is in sediment storage, due to the larger drainage basin of the Gallegos site.

Either reservoir would be filled by releasing water from the Burnham lateral down Moncisco Wash. Such an arrangement requires more energy than pumping directly to the reservoir but saves the capital cost of an additional pumping plant and pipeline to supply the reservoir. A conveyance canal with a capacity of 260 cfs would connect the outlet works to the Main Canal for either site.

Table 2 summarizes the capital cost, and annual operation, maintenance and replacement (OM&R) cost for the two sites. These costs were provided by the BOR Farmington Construction Office. The Moncisco site is the least cost alternative at \$48,600,000 estimated total cost. Foundation investigations and archeological clearance have not been completed for this site. If foundation conditions are adequate, it appears that this is the best choice. Further investigations will be required to determine feasibility.

The reservoir supplies 12.6% of the system capacity during peak requirements (260 cfs of the 2,060 cfs total capacity for 15 days of operation). If it is assumed that this 12.6% increase in capacity is required, then the last 13,940 acres of the project (12.6% of 110,630 acres) constitute the area requiring the construction of a storage reservoir. Therefore, the marginal cost (cost of adding this margin to the project allocated to the acreage added) of the Moncisco reservoir allocated to 12.6% of the project is \$3,486 per acre, with an annual OM&R cost of \$24 per acre. For the Gallegos site the marginal costs are \$5,136 and \$27 per acre, respectively for capital and OM&R. These costs are for the reservoir only and do not include conveyance, delivery and on-farm costs for this increment of the total system.

### **Irrigation Demand Analysis**

At the time the assessment was made to include the reservoir as a part of the all-sprinkler project, there was little project history. This analysis was designed to look at various parts of the system and possible climatic and crop mix scenarios to determine historic demand and system capacity based on 12 years of historic data. The following elements in the study covering 1982-1993 were considered:

- the conveyance capacity of each canal reach
- conveyance efficiencies found using the diversions, the agricultural deliveries, and spills in various NIIP reports
- application efficiencies from delivery data and consumptive use of the historical crop mixes
- the crop mix with the maximum water use and the historical water use of the mix spanning a 1951-1993 climatic record
- the comparison of canal capacity and peak crop water use
- the possible limits on future crop mixes
- Actual peak diversions per acre from historic conditions

Each of these elements will be considered in the following discussion.

### **Conveyance Capacity**

The BOR Farmington Construction Office provided the schematic diagram of the canal system shown in Figure 2. The schematic shows the flow in each canal reach and the combined acreage served by turnouts in each reach. On each canal reach, the capacity per acre was calculated by dividing the design flow by

Table 1. Storage Capacity for two potential Gallegos Reservoir sites.

	Gallegos Wash Site (acre-ft)	Moncisco Wash Site (acre-ft)
Required Operational Storage	7,735	7,735
100 Year Sediment	3,850	1,800
Evaporation Loss	450	450
Seepage Loss	270	270
<b>Total Active Storage</b>	<b>12,305</b>	<b>10,255</b>

Table 2. Estimated costs for two potential Gallegos Reservoir sites.

	Gallegos Wash Site	Moncisco Wash Site
<u>Construction Cost Estimate:</u>		
Right-of-Way and Relocations	\$11,000,000	\$1,600,000
Archeological Mitigation	\$1,800,000	\$1,500,000
Construction Dam, Spillway & Outlet Canal	\$42,000,000	\$34,000,000
Construct Inlet Channel	\$2,500,000	\$1,800,000
Non-contract Costs	\$14,300,000	\$9,700,000
<b>TOTAL</b>	<b>\$71,600,000</b>	<b>\$48,600,000</b>
<u>Estimated Annual OM&amp;R Costs:</u>		
Operation and Maintenance	\$174,000	\$174,000
Replacement Fund	\$191,000	\$155,000
Pumping Costs at Gallegos PP*	\$1,000	\$1,000
Pumping Costs at Gallegos PP**	\$7,000	\$7,000
<b>TOTAL ANNUAL COST</b>	<b>\$373,000</b>	<b>\$337,000</b>

\* Based on replacing 720 AF evaporation and seepage only.

\*\* Based on pumping 7735 AF to meet operational storage requirements.

Note: Related OM&R costs for other project features are not included.

PROPOSED CRITERIA WITH 110,630 ACRES

May 20, 1994

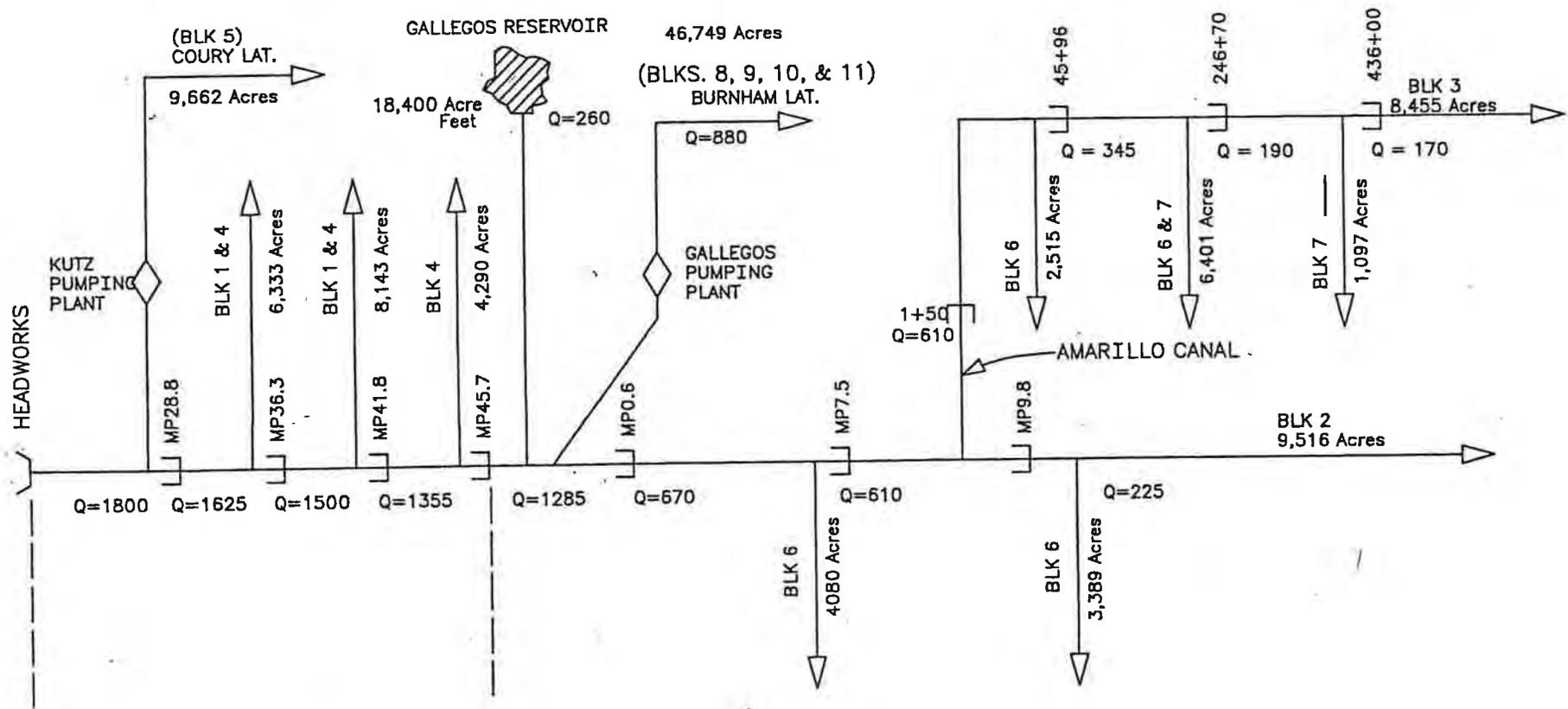


Figure 2. NIIP Canal System Schematic Diagram

the number of acres downstream of the reach. The calculated capacity per acre is compiled for each reach in Table 3.

Canal capacity below the connection with Gallegos reservoir is not limiting. Of the reaches above Gallegos Reservoir (MP45.7 and above), MP 41.8 - MP 45.7 and MP 45.7 - MP 0.6 have the smallest capacities of any reaches. The capacities are 7.03 gpm/acre and 7.02 gpm/acre respectively. Any crop mix requiring more than this amount of water would be under irrigated during the peak period of water use. Therefore, the limiting capacity of the NIIP canal system is 7 gpm/acre assuming no fallow land and irrigation of the full 110,630 acres.

### Conveyance Efficiency

The diversions, the metered agricultural deliveries, and the spills were compiled from the monthly NIIP water reports. These values were used to compute various conveyance efficiencies during the three summer months of June, July and August. The data for the period 1989 through 1993 are compiled in Table 4. This period was used since it is reflective of the present design based on primarily center-pivot irrigation.

The second and third columns of Table 4, monthly Diversion and Ag Delivery, were compiled from daily records. With these variables, the efficiency of the conveyance system was calculated in column 6. Adding in the RIP (releases required for dilution under endangered species consultation requirements) and spill components, gave the other efficiencies listed in the remaining two columns. The mean and standard deviation of each efficiency were determined along with the upper and lower bounds (at the 95% confidence level). Briefly stated, the mean efficiency of the NIIP canal system, looking only at diversions and metered agricultural deliveries, is 90% over the period 1989 to 1993 with a standard deviation of 5.7%. The mean value is expected to lie between 87.2% and 93.4% about 95% of the time. Therefore, a worst case conveyance efficiency for the project is about 87%. This includes delivering dilution water (RIP) to Gallegos Wash and Ojo Amarillo. It is anticipated that this release will not be required in the future as the selenium studies are completed and the loads decreased. In this case the efficiency will improve to about 91.5% average and 88.7% minimum, providing more flexibility.

Table 3. Canal design flow listed by reach

Reach	Design Q	Downstream Acres	gpm/acre
Headworks - MP28.8	1,800	110,630	7.30
MP28.8 - 36.3	1,625	100,968	7.22
MP36.3 - 41.8	1,500	94,635	7.11
MP41.8 - 45.7	1,355	86,492	7.03
MP45.7-Burnham	1,285	82,202	7.02
Burnham Lat	880	46,749	8.45
MP0.6 - 7.5	670	35,453	8.48
MP7.5 - 9.8	610	31,373	8.73
MP9.8 - End	225	12,905	7.82
<u>Amarillo Canal</u>			
001+50 - 045+96	610	18,468	14.82
045+96 - 246+70	345	15,953	9.71
246+70 - 438+00	190	9,552	8.93
438+00 - end	170	8,455	9.02

Table 4. Components of Water Balance and Calculated Efficiencies (values in acre-feet)

Date	Diversion	Ag Delivery	RIP Delivery	Spill	Ag/ Diversion	(Ag+RIP)/ Diversion	(Ag+RIP+Spill)/ Diversion
6/89	34,987	30,402	0	262	86.9%	86.9%	87.9%
7/89	33,066	31,676	0	327	95.8%	95.8%	96.8%
8/89*	28,702	29,769	0	307	103.7%	103.7%	104.8%
6/90	32,442	27,786	0	319	85.6%	85.6%	86.6%
7/90	30,862	29,584	0	338	95.9%	95.9%	97.0%
8/90	26,457	24,070	0	354	91.0%	91.0%	92.3%
6/91	26,768	22,984	0	282	85.9%	85.9%	86.9%
7/91	36,353	32,677	0	258	89.9%	89.9%	90.6%
8/91	30,076	26,176	0	890	87.0%	87.0%	90.0%
6/92	26,393	25,022	884	150	94.8%	98.2%	98.7%
7/92	31,739	25,894	1846	183	81.6%	87.4%	88.0%
8/92*	28,397	26,797	3131	166	94.4%	105.4%	106.0%
6/93	32,571	28,799	1437	880	88.4%	92.8%	95.5%
7/93	39,046	34,535	1860	338	88.4%	93.2%	94.1%
8/93	28,292	24,212	756	675	85.6%	88.3%	90.6%
mean					90.3%	92.5%	93.7%
st dev					5.7%	6.2%	6.1%
upper					93.4%	95.9%	97.1%
lower					87.2%	89.0%	90.3%

\* There is a probable data error this month. More water was recorded as delivered and spilled than diverted. These values were not used in the statistical analysis.

#### Application Efficiency Based on Historical Crop Mixes

The crop mixes reported by NAPI were compiled for the years 1982-1993. The crop water use or evapotranspiration (ET) and the consumptive irrigation requirement (CIR= evapotranspiration less effective precipitation) for each year were calculated using the Hargreaves-Samani method. This method for finding potential crop ET and CIR uses monthly maximum and minimum temperature, monthly precipitation, and daily values of crop coefficients based on planting, full-cover and harvest dates. During the calculation, the crop ET is calculated in daily intervals, which contains the peak daily values. The application efficiency was determined by dividing the calculated CIR by the metered agricultural delivery. The resulting monthly efficiencies appear in Table 5.

The application efficiency appears to be improving with time. Also, the efficiency is typically the highest during July, indicating that the on-farm system capacity is limiting waste. Based on the trend we estimate the application or on-farm efficiency to be about 75%. This value appears reasonable because evaporation losses typically average about 10% and deep percolation losses under average management for center-pivot irrigation is usually between 10 and 15% for average management. Based on best management practices, the attainable efficiency is about 80%. Utilizing 75% during the peak month is reasonable given the history of operation and the capability of the system.

Table 5. Calculated Application Efficiencies

Date	Agricultural Delivery	Calculated CIR	CIR/Delivery (appl. efficiency)
6/89	30,402	16,134	53.1%
7/89	31,676	20,706	65.4%
8/89	29,769	15,487	52.0%
6/90	27,786	15,488	55.7%
7/90	29,584	20,480	69.2%
8/90	24,070	15,233	63.3%
6/91	22,984	13,344	58.1%
7/91	32,677	21,340	65.3%
8/91	26,176	17,642	67.4%
6/92	25,022	17,816	71.2%
7/92	25,894	18,959	73.2%
8/92	26,797	15,769	58.8%
6/93	28,799	18,329	63.6%
7/93	34,535	26,611	77.1%
8/93	24,212	16,868	69.7%

Crop Mix With Maximum Water Use

The mean monthly ET for all twelve crop mixes (1982 . . . 1993) were computed for a long-term climatic interval to find which mix required the most water. The interval, 1951-1993, was chosen because it was easy to obtain suitable monthly climatic data - maximum and minimum temperatures and precipitation. A daily 1951-1993 temperature record was formed by combining the 1948-1978 Farmington with the 1978-1993 Experiment Station records. A daily precipitation record was also formed using data from the same stations. The few days of missing data were filled with values from the Fruitland weather station. The daily records were then converted to files of monthly values for calculating the monthly crop ET over the period, 1951-1993. The multi-year ET calculations were repeated for each of the twelve historic crop mixes.

The crop mix with the maximum mean ET, the mix of 1982, was selected from these multi-year runs. The chosen mix was investigated in greater detail on a year by year basis. The daily ET was calculated for each year, 1951 to 1993. The warmest and driest years in this interval occurred in the 1950's. As a result the years 1951 and 1959 contained the highest daily ET in the whole interval. The computed daily ET (with the 1982 crop mix) for 1959 is plotted in Figure 3. As can be seen from the figure, the highest ET typically occurs in the second week of July and continues about a week at the peak. The maximum daily values within this weekly period in 1959 are shown in Table 6.

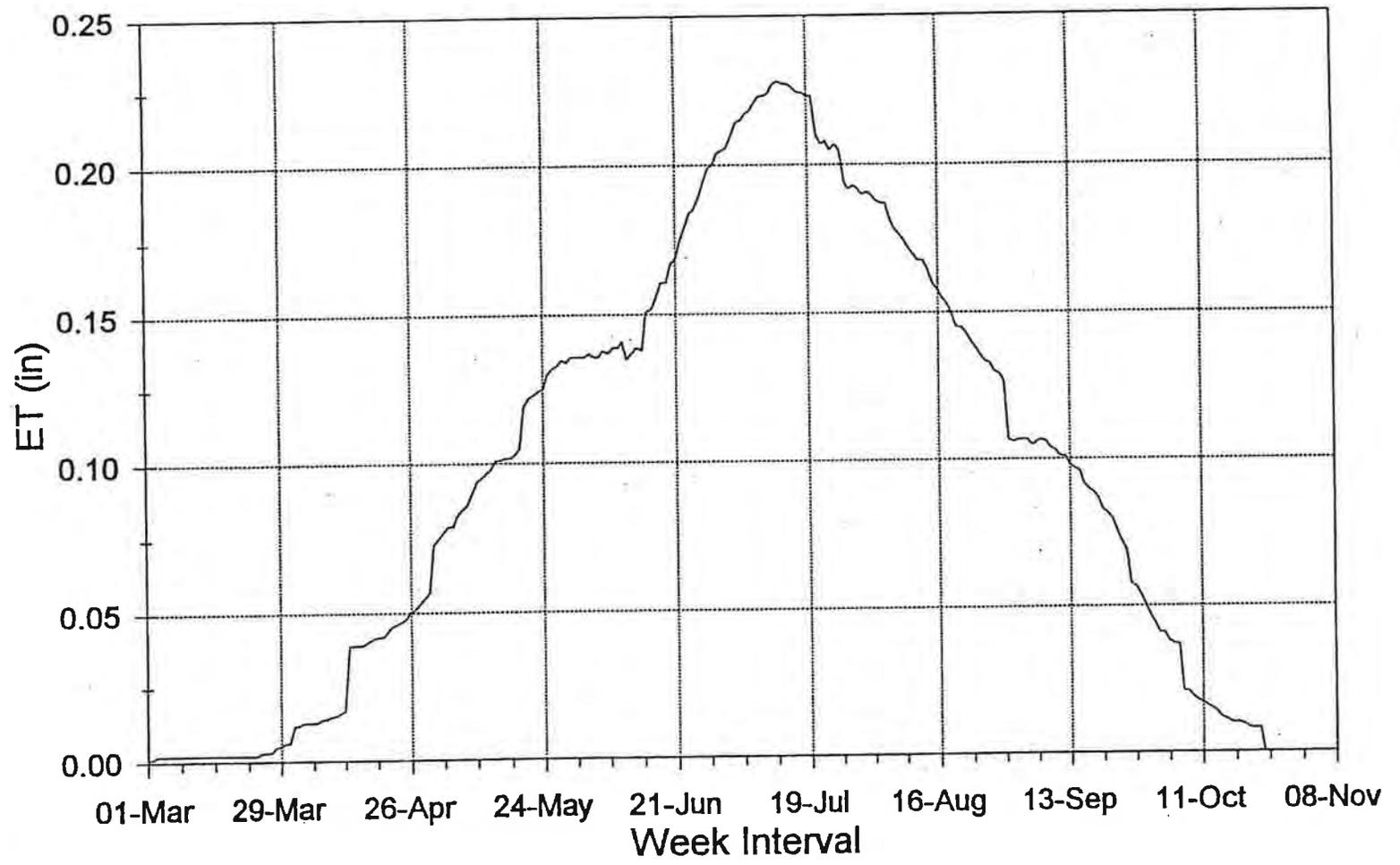


Figure 3. NIIP 1982 Crop Mix, 1959 Climate

Table 6. Crop mix with maximum daily evapotranspiration expressed as inches/day

Crop	Fraction of Mix	Daily ET
Alfalfa	0.170	0.29
Beans	0.207	0.27
Corn	0.260	0.30
Grain (spring)	0.155	0.13
Grain (winter)	0.053	0.00
Grass crops	0.047	0.28
Potatoes	0.015	0.27
Second crops	0.094	0.15
Crop Mix	1.000	0.235

As a check on the ET calculation, the calculated daily peak ET values for the years 1979 through 1982 were compared against measured daily peak ET, reported by B. J. Boman in "Consumptive Use on the Navajo Indian Irrigation Project," United States Department of Interior, Bureau of Reclamation, Bureau of Indian Affairs, Farmington, New Mexico, September 1983. A comparison summary of the measured and the calculated peak ET values is shown in Table 7. no. of report

No effort was made to match planting dates for the crop reported in the above study so the occurrence of the peak ET did not match well. However, the magnitude of the measured peak and calculated peak values matched exactly in three of the four years. The difference between peaks in the non-matching year, 1981, was only 0.01 inches (4% of total peak ET). Based on these comparisons, the Hargreaves-Samani method gives reliable peak ET estimates in those years ET was measured. So the peak values calculated in the unusually warm and dry period in 1950's are thought to be accurate peak ET estimates. The peak daily ET values compiled in Table 5 are 10-day running mean values calculated in this manner.

The mean maximum ET of the mix, 0.235 inches/day, translates into a consumptive irrigation demand of 4.43 gpm/acre. Utilizing the mean conveyance (ag/diversion) and application efficiencies, the peak diversion requirement demand calculates to be:

$$\text{Peak Diversion Requirement} = 4.43 / (0.903) / (0.75) = 6.54 \text{ gpm/acre}$$

This value represents the case occurring if the project had been operational since 1951 and the project planted with the crop mix of highest water use. The canal capacity is 7.02 gpm/acre so the canal would not be limiting any time using the historical crop mix with the highest water use on 110,630 cropped acres.

Table 7. Comparison of the measured and calculated peak ET values from NIIP.

Year	Occurrence	Relative Magnitude
1979	26 June vs 27 June	same values
1980	19 June vs 8 July	same values
1981	18 July vs 9 July	measured 0.01 inch > calculated
1982	22 July vs 8 July	same values

### Limitation on Future Crop Mix

The analysis shows that the canal capacity exceeds the worst case scenario using the historical crop mixes. However, if small grain crops were replaced with crops of higher water use, then the canal capacity could conceivably become limiting.

To investigate the limitation, we divided the daily crop ET into two groups:

- (1) alfalfa, beans, corn, grass, or potatoes with mean peak daily value of about 0.28 inches/day
- (2) small grain (both winter and spring varieties) and second crops with mean peak daily value of about 0.09 inches/day corresponding to the peak period of the higher water use crops (mid-July).

The 1982 crop mix consisted of 71% of the crops in group 1 with group 2 crops making up the remainder. As calculated above, the peak diversion requirement was found to be 6.54 gpm/acre. Changing the mix to bring the demand up to 7.02 gpm/acre, we find that the percentage of group 1 crops could increase to 80%. As before, the calculation assumes a conveyance efficiency of 90.3% and an application efficiency of 75%.

The worst case, using 87.2%, the lower bound of the observed conveyance efficiency, should also be considered. With this efficiency, the peak diversion requirement for the 1982 mix would be 6.77 gpm/acre, a value still less than the canal capacity of 7.02 gpm/acre. With this reduced efficiency, the portion of group 1 crops could be increased to 75%.

With Gallegos Reservoir in place, the limiting system capacity is 8.35 gpm/acre, allowing 100% of the crop mix to be from group 1. Even though the system would have the capacity to eliminate small grain from the mix it is not agronomically viable to do so. In as much as small grains are an agronomic requirement in crop rotation for the crops being grown, reducing the acreage of these crops below 20% of the total mix is not agronomically sound.

### Historic Diversions

The historic peak diversions per fully irrigated area (average of five highest consecutive days) were computed for the period 1989 - 1993. The peak periods and mean daily diversion - gpm/acre are shown in Table 8. From historic conditions, the peak diversion would have exceeded system capacity for conditions of full

Table 8. Summary of historic diversion for NIIP

Year	Peak Period	Diversion gpm/acre
1989	12 June - 16 June	6.46
1990	27 June - 1 July	7.74
1991	4 July - 8 July	6.88
1992	4 July - 8 July	6.59
1993	23 July - 27 July	6.27

irrigation (110,630 acres irrigated) in 1990 with a peak diversion of 7.74 gpm per acre. All other years were less than the system capacity.

It should be noted that 1990 was the third lowest irrigation demand year in the period of record. The increase in peak demand in that year does not match crop demand. Also, the diversion exceeds the requested delivery during this time period, indicating possibility of a spill. The demand on either side of this period is well within system capacity. This data point is considered anomalous since it is not supported by other indications of increased demand and could easily be eliminated through improved management.

It should also be noted that this calculation is the most conservative view of per acre diversion. It does not consider delivery to conservation acreage that may have occurred on the particular dates, spills or releases above the mean, or deliveries for other uses. Given these limitations, the actual diversion compares favorably to the computed required deliveries.

### Summary

The crop mix with the largest demand was the 1982 mix with 71% of higher water demand crops ( alfalfa, beans, corn, grass and potatoes). With this mix and the hottest summer temperatures in the last 53 years, the adjusted demand was calculated to be 6.54 gpm/acre, which is still less than the limiting canal capacity of 7.02 gpm/acre. Hence, the NIIP canal capacity would never have been limiting for the historical mix with the highest water use within the period 1951-1993 even though the RIP and spill flows were included.

Under the warmest summer conditions occurring in the last 53 years, the portion of crops with the higher peak demand could be increased to 80%. Under a scenario of using a lower conveyance efficiency (the lower bound of the 95% confidence interval), the mix could still be increased to 75% of the higher peak use crops.

Since the limiting canal capacity is some 40 miles downstream from the diversion, as much as one half the conveyance loss occurs upstream of the reach with limiting capacity. Since this portion of the loss could be met by the extra capacity of the upper reaches relative to the limiting reach, the conveyance efficiency of the remaining system would be increased by 3 - 4%. Thereby, the delivery capacity is increased by the same amount, putting the diversion capacity closer to 7.3 gpm per acre than the 7.02 gpm/acre used in the calculations. Therefore, the conclusions are conservative.

If all high water use crops were grown (no small grain) then the capacity of the system would be exceeded for 22 days, with a cumulative deficit of 0.5 inches. If the fields entered this peak use period with not more than 1.0 inch of soil moisture deficit, no crop loss would result from the additional 0.5 inches of accumulated deficit. Such operation would require an increased level of management, but within normal operating parameters for modern farming practices.

From this analysis the no-action alternative would allow full irrigation for the highest water use crop mix ever grown to date on 110,630 acres with no fallow land. In fact, the portion of high water use crops could increase by 9% and the existing canal system would still be adequate. Reducing the conveyance efficiency would still allow some flexibility in changing the crop mix. The capacity analysis is supported by historic diversions, with the exception of one 5-day period in 1990, which appears to be anomalous when compared to the required demand during this time period.

By not constructing Gallegos Reservoir, the crop mix must include at least 20% small grains or second crops unless changes in operation or system capacity are made. This limitation is not considered significant in that small grain percentages of this magnitude are required for agronomically sound crop rotation and the historic mix has never had less than 29% small grains. Alternately, modified management practices would allow full irrigation of a cropping pattern consisting of all high water use crops without yield impact.

## Conclusions

Construction of Gallegos Reservoir represents large capital expenditure (\$48,600,000 to \$71,600,000) and a significant annual OM&R cost (\$337,000 to \$373,000). Under the original system capacity guidelines, Gallegos Reservoir was required for the last 12.6% of the project acreage. On a marginal cost basis, the capital cost per acre necessary to construct Gallegos reservoir for this last 13,940 acres is high (\$3,486 to \$5,136 per acre) and the annual OM&R cost is substantial (\$24 to \$27 per acre). These costs are in addition to the conveyance, delivery and on-farm costs.

Based on historic cropping and water use patterns, the existing canal system without the added peaking capacity of Gallegos Reservoir is adequate to meet peak demands in the driest of conditions and with the highest water use crop mix that has historically been raised. In fact, high water use crops could be increased in the crop mix relative to small grains by 9%, allowing small grain acreage to be as low as 20% without changing operating procedures or increasing system capacity. Reducing small grain percentages below 20% in a rotation that includes potatoes and other row crops at the levels grown on NIIP is agronomically risky. The present system has adequate capacity to meet the demands of most agronomically sound crop mixes without the need for Gallegos Reservoir and without changes in operating procedures.

If the crop mix changes in the future and small grains are eliminated, system operation could be modified to allow 0.5 inches of deficit irrigation through the peak period to account for the reduced capacity. Such operation is within normal operating parameters of modern, high input, agricultural practices and would not result in crop loss.

Foregoing construction of Gallegos Reservoir would result in a savings in capital cost of from \$48,600,000 to \$71,600,000 and would result in no crop loss and no changes in system operation under any historic cropping and climate condition for 110,630 planted acres. With minor operational changes, the maximum water use cropping pattern possible (no small grain) could be raised without crop loss on

the full 110,630 acres. Since there is no negative impact to the irrigation project, the preferred alternative is the "no-action" alternative. The construction of Gallegos reservoir, with its associated environmental impact, is not justified on the basis of required system capacity to meet peak irrigation demands.

## GLOSSARY OF TERMS AND ABBREVIATIONS

BIA	Bureau of Indian Affairs
BOR	Bureau of Reclamation
CIR	consumptive irrigation requirement defined as crop evapotranspiration less effective precipitation
cfs	cubic feet per second
EIS	Environmental Impact Statement
ET	evapotranspiration defined as water consumed by a crop through evaporation and transpiration
gpm	gallons per minute
Marginal Cost	The cost of adding the next (marginal) increment to a project, computed on a per acre basis
NAPI	Navajo Agricultural Products Industry
NEPA	National Environmental Policy Act
NIIP	Navajo Indian Irrigation Project
OM&R	operation, maintenance and replacement
RIP	Recovery Implementation Plan for the San Juan River endangered fish

NAVAJO GALLUP WATER SUPPLY PROJECT  
MONCISCO RESERVOIR AND NIIP OPERATION

**Appendix H.1**

**NAVAJO INDIAN IRRIGATION PROJECT**  
**Evapotranspiration Rates 2000**  
**Keller Bleisner Engineering**

Navajo Indian Irrigation Project  
 Evapotranspiration Rates  
 Keller Bleisner Engineering

conveyance efficiency 90%  
 Application Efficiency 75%  
 Assumes no precipitation - to be used for purposes of capacity determination only  
 Based on 2000 calibrated ET and peak efficiency  
 Alfalfa cuttings staggered over 25 days. Days between 1st and 2nd - 33, between 2nd and 3rd - 36 days, between 3rd and 4th - 40 days  
 Does not include fall grain ET or Alfalfa ET after 10/15  
 Other crops are proxied by those shown - Mint, sod, pasture by alfalfa, pumpkins by potatoes

full development acreage percent in mix Date	Wheat	Beans	Potatoes	Corn	Alfalfa	Average	10-day running ave ET in/day	Diversion Required for 110,630 acres	10-day average ET gpm/ac	10-day average Diversion gpm/ac
	22,126 20%	11,063 10%	17,701 16%	28,764 26%	30,976 28%	ET-in/day				
Maximum	0.38	0.32	0.36	0.39	0.39	0.29	0.26	1,770.82	4.85	7.18
03/08	0.04	0.00	0.00	0.00	0.03	0.02				
03/09	0.04	0.00	0.00	0.00	0.03	0.02				
03/10	0.04	0.00	0.00	0.00	0.05	0.02				
03/11	0.04	0.00	0.00	0.00	0.05	0.02				
03/12	0.06	0.00	0.00	0.00	0.05	0.03	0.02	151.56	0.42	0.61
03/13	0.04	0.00	0.00	0.00	0.06	0.02	0.02	160.65	0.44	0.65
03/14	0.04	0.00	0.00	0.00	0.06	0.02	0.02	166.30	0.46	0.67
03/15	0.02	0.00	0.00	0.00	0.06	0.02	0.02	171.83	0.47	0.70
03/16	0.03	0.00	0.00	0.00	0.06	0.02	0.03	174.32	0.48	0.71
03/17	0.04	0.00	0.00	0.00	0.06	0.03	0.02	169.25	0.46	0.69
03/18	0.04	0.00	0.00	0.00	0.07	0.03	0.02	169.17	0.46	0.69
03/19	0.04	0.00	0.00	0.00	0.06	0.03	0.02	170.05	0.47	0.69
03/20	0.05	0.00	0.00	0.00	0.07	0.03	0.03	179.24	0.49	0.73
03/21	0.06	0.00	0.00	0.00	0.05	0.03	0.03	190.00	0.52	0.77
03/22	0.07	0.00	0.00	0.00	0.02	0.02	0.03	200.76	0.55	0.81
03/23	0.07	0.00	0.00	0.00	0.04	0.02	0.03	205.86	0.56	0.84
03/24	0.06	0.00	0.00	0.00	0.05	0.03	0.03	199.25	0.55	0.81
03/25	0.07	0.00	0.00	0.00	0.08	0.04	0.03	200.66	0.55	0.81
03/26	0.07	0.00	0.00	0.00	0.09	0.04	0.03	200.95	0.55	0.82
03/27	0.07	0.00	0.00	0.00	0.10	0.04	0.03	201.95	0.55	0.82
03/28	0.06	0.00	0.00	0.00	0.09	0.04	0.03	206.42	0.57	0.84
03/29	0.01	0.00	0.00	0.00	0.05	0.02	0.03	217.93	0.60	0.88
03/30	0.03	0.00	0.00	0.00	0.09	0.03	0.03	227.17	0.62	0.92
03/31	0.05	0.00	0.00	0.00	0.06	0.03	0.03	231.41	0.63	0.94
04/01	0.07	0.00	0.00	0.00	0.02	0.02	0.04	246.34	0.67	1.00
04/02	0.07	0.00	0.00	0.00	0.06	0.03	0.04	260.45	0.71	1.06
04/03	0.09	0.00	0.00	0.00	0.09	0.04	0.04	286.42	0.78	1.16
04/04	0.09	0.00	0.00	0.00	0.11	0.05	0.04	297.62	0.81	1.21
04/05	0.04	0.00	0.00	0.00	0.13	0.04	0.05	324.28	0.89	1.32
04/06	0.08	0.00	0.00	0.00	0.17	0.06	0.05	354.74	0.97	1.44
04/07	0.04	0.00	0.00	0.00	0.17	0.06	0.05	369.13	1.01	1.50
04/08	0.01	0.00	0.00	0.00	0.18	0.05	0.06	386.55	1.06	1.57
04/09	0.04	0.00	0.00	0.00	0.14	0.05	0.06	411.49	1.13	1.67
04/10	0.08	0.00	0.00	0.00	0.18	0.06	0.06	442.96	1.21	1.80
04/11	0.10	0.00	0.00	0.00	0.16	0.06	0.06	443.02	1.21	1.80
04/12	0.11	0.00	0.00	0.00	0.11	0.05	0.07	455.29	1.25	1.85
04/13	0.13	0.00	0.00	0.00	0.15	0.07	0.07	480.56	1.32	1.95
04/14	0.15	0.00	0.00	0.00	0.19	0.09	0.07	489.05	1.34	1.98
04/15	0.15	0.00	0.00	0.00	0.21	0.09	0.07	495.83	1.36	2.01
04/16	0.12	0.00	0.00	0.00	0.14	0.06	0.07	509.65	1.40	2.07
04/17	0.14	0.00	0.00	0.00	0.17	0.07	0.08	531.31	1.45	2.16
04/18	0.13	0.00	0.00	0.00	0.23	0.09	0.08	540.58	1.48	2.19
04/19	0.06	0.00	0.00	0.00	0.17	0.06	0.08	541.99	1.48	2.20
04/20	0.12	0.00	0.00	0.00	0.18	0.07	0.08	547.28	1.50	2.22
04/21	0.14	0.00	0.00	0.00	0.20	0.08	0.08	575.83	1.58	2.34
04/22	0.18	0.00	0.00	0.00	0.17	0.08	0.09	597.60	1.64	2.42
04/23	0.11	0.00	0.00	0.00	0.21	0.08	0.09	613.70	1.68	2.49
04/24	0.13	0.00	0.00	0.00	0.22	0.09	0.09	652.50	1.79	2.65
04/25	0.17	0.00	0.01	0.00	0.22	0.10	0.10	677.45	1.86	2.75
04/26	0.13	0.00	0.02	0.00	0.27	0.10	0.10	691.16	1.89	2.80
04/27	0.13	0.00	0.02	0.00	0.27	0.11	0.11	723.32	1.98	2.93
04/28	0.13	0.00	0.02	0.01	0.29	0.11	0.11	761.55	2.09	3.09
04/29	0.12	0.00	0.04	0.01	0.30	0.12	0.12	794.63	2.18	3.22
04/30	0.17	0.00	0.05	0.01	0.23	0.11	0.12	832.27	2.28	3.38
05/01	0.18	0.00	0.05	0.02	0.20	0.10	0.12	858.76	2.35	3.48
05/02	0.16	0.00	0.08	0.02	0.29	0.13	0.13	882.50	2.42	3.58

Navajo Indian Irrigation Project  
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Alfalfa cuttings staggered over 25 days. Days between 1st and 2nd - 33, between 2nd and 3rd - 36 days, between 3rd and 4th - 40 days  
 Does not include fall grain ET or Alfalfa ET after 10/15

Other crops are proxied by those shown - Mint, sod, pasture by alfalfa, pumpkins by potatoes

full development acreage percent in mix Date	Wheat	Beans	Potatoes	Corn	Alfalfa	Average	10-day running ave ET in/day	Diversion Required for 110,630 acres	10-day average ET gpm/ac	10-day average Diversion gpm/ac
	22,126 20%	11,063 10%	17,701 16%	28,764 26%	30,976 28%	ET-in/day				
Maximum	0.38	0.32	0.36	0.39	0.39	0.29	0.26	1,770.82	4.85	7.18
05/03	0.19	0.00	0.09	0.02	0.28	0.14	0.13	882.29	2.42	3.58
05/04	0.20	0.00	0.09	0.02	0.28	0.14	0.13	894.39	2.45	3.63
05/05	0.22	0.00	0.10	0.02	0.31	0.15	0.14	934.27	2.56	3.79
05/06	0.23	0.00	0.11	0.02	0.27	0.14	0.14	978.04	2.68	3.97
05/07	0.15	0.00	0.07	0.01	0.34	0.14	0.14	992.32	2.72	4.03
05/08	0.14	0.00	0.07	0.02	0.25	0.11	0.14	997.00	2.73	4.04
05/09	0.20	0.00	0.09	0.02	0.26	0.13	0.15	1,024.75	2.81	4.16
05/10	0.21	0.00	0.09	0.02	0.37	0.17	0.15	1,018.67	2.79	4.13
05/11	0.22	0.00	0.10	0.03	0.36	0.17	0.15	1,033.86	2.83	4.19
05/12	0.27	0.00	0.12	0.07	0.22	0.15	0.15	1,057.56	2.90	4.29
05/13	0.20	0.00	0.09	0.08	0.24	0.14	0.16	1,093.17	2.99	4.43
05/14	0.28	0.00	0.12	0.12	0.24	0.18	0.16	1,081.48	2.96	4.39
05/15	0.20	0.00	0.09	0.09	0.24	0.14	0.15	1,056.28	2.89	4.29
05/16	0.20	0.00	0.09	0.09	0.31	0.16	0.15	1,029.39	2.82	4.18
05/17	0.32	0.00	0.14	0.13	0.19	0.18	0.15	1,029.44	2.82	4.18
05/18	0.31	0.00	0.13	0.13	0.17	0.16	0.15	1,058.25	2.90	4.29
05/19	0.18	0.00	0.08	0.08	0.17	0.12	0.15	1,038.10	2.84	4.21
05/20	0.21	0.00	0.09	0.09	0.19	0.13	0.15	1,017.58	2.79	4.13
05/21	0.18	0.00	0.08	0.09	0.20	0.13	0.14	990.57	2.71	4.02
05/22	0.21	0.00	0.09	0.10	0.24	0.15	0.14	973.92	2.67	3.95
05/23	0.28	0.00	0.14	0.13	0.26	0.19	0.14	976.52	2.67	3.96
05/24	0.20	0.00	0.10	0.08	0.24	0.15	0.15	1,029.62	2.82	4.18
05/25	0.17	0.00	0.08	0.08	0.17	0.11	0.16	1,069.99	2.93	4.34
05/26	0.18	0.00	0.09	0.08	0.19	0.13	0.16	1,108.79	3.04	4.50
05/27	0.22	0.00	0.11	0.11	0.21	0.15	0.16	1,120.28	3.07	4.54
05/28	0.25	0.00	0.13	0.12	0.23	0.17	0.16	1,117.12	3.06	4.53
05/29	0.28	0.00	0.14	0.14	0.28	0.19	0.17	1,150.00	3.15	4.67
05/30	0.29	0.00	0.17	0.15	0.24	0.19	0.18	1,216.23	3.33	4.93
05/31	0.30	0.00	0.17	0.14	0.22	0.19	0.19	1,290.55	3.53	5.24
06/01	0.26	0.00	0.15	0.11	0.23	0.17	0.20	1,343.36	3.68	5.45
06/02	0.25	0.00	0.14	0.14	0.26	0.18	0.20	1,372.12	3.76	5.57
06/03	0.27	0.00	0.16	0.15	0.27	0.19	0.20	1,376.11	3.77	5.58
06/04	0.28	0.00	0.17	0.17	0.30	0.21	0.20	1,398.79	3.83	5.67
06/05	0.34	0.00	0.20	0.19	0.30	0.23	0.21	1,413.03	3.87	5.73
06/06	0.35	0.00	0.22	0.19	0.26	0.23	0.21	1,450.59	3.97	5.88
06/07	0.30	0.00	0.20	0.17	0.27	0.21	0.22	1,510.00	4.13	6.13
06/08	0.27	0.02	0.18	0.17	0.26	0.20	0.23	1,554.58	4.26	6.31
06/09	0.31	0.02	0.21	0.20	0.26	0.22	0.23	1,585.22	4.34	6.43
06/10	0.28	0.02	0.19	0.20	0.24	0.21	0.23	1,591.09	4.36	6.45
06/11	0.29	0.02	0.20	0.22	0.25	0.22	0.23	1,602.86	4.39	6.50
06/12	0.36	0.03	0.25	0.26	0.30	0.27	0.23	1,605.04	4.40	6.51
06/13	0.31	0.02	0.23	0.21	0.37	0.26	0.24	1,624.84	4.45	6.59
06/14	0.30	0.02	0.23	0.21	0.36	0.25	0.24	1,640.63	4.49	6.66
06/15	0.25	0.02	0.20	0.19	0.39	0.24	0.25	1,695.44	4.64	6.88
06/16	0.30	0.02	0.24	0.20	0.33	0.24	0.25	1,727.72	4.73	7.01
06/17	0.25	0.04	0.20	0.19	0.28	0.21	0.25	1,740.24	4.77	7.06
06/18	0.28	0.04	0.22	0.21	0.28	0.23	0.25	1,727.58	4.73	7.01
06/19	0.29	0.06	0.23	0.23	0.30	0.25	0.25	1,730.15	4.74	7.02
06/20	0.36	0.11	0.31	0.26	0.31	0.29	0.25	1,728.48	4.73	7.01
06/21	0.33	0.10	0.28	0.26	0.29	0.27	0.25	1,727.88	4.73	7.01
06/22	0.38	0.12	0.33	0.29	0.25	0.29	0.25	1,754.42	4.80	7.12
06/23	0.30	0.09	0.26	0.25	0.22	0.24	0.26	1,770.82	4.85	7.18
06/24	0.31	0.10	0.28	0.26	0.27	0.26	0.26	1,765.42	4.83	7.16
06/25	0.26	0.08	0.23	0.26	0.27	0.24	0.25	1,722.81	4.72	6.99
06/26	0.27	0.09	0.25	0.27	0.26	0.24	0.25	1,714.92	4.70	6.96
06/27	0.31	0.10	0.30	0.27	0.22	0.25	0.25	1,687.53	4.62	6.85
06/28	0.30	0.09	0.30	0.26	0.25	0.25	0.25	1,688.02	4.62	6.85

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full development acreage percent in mix Date	Wheat	Beans	Potatoes	Corn	Alfalfa	Average	10-day running ave ET in/day	Diversion Required for 110,630 acres	10-day average ET gpm/ac	10-day average Diversion gpm/ac
	22,126 20%	11,063 10%	17,701 16%	28,764 26%	30,976 28%	ET-in/day				
Maximum	0.38	0.32	0.36	0.39	0.39	0.29	0.26	1,770.82	4.85	7.18
06/29	0.25	0.09	0.26	0.26	0.25	0.24	0.24	1,671.32	4.58	6.78
06/30	0.25	0.09	0.26	0.24	0.21	0.22	0.24	1,684.86	4.61	6.84
07/01	0.27	0.10	0.30	0.27	0.26	0.26	0.25	1,689.42	4.63	6.85
07/02	0.27	0.10	0.30	0.28	0.21	0.25	0.24	1,672.61	4.58	6.79
07/03	0.24	0.10	0.26	0.27	0.26	0.24	0.24	1,662.33	4.55	6.74
07/04	0.21	0.09	0.25	0.27	0.26	0.23	0.24	1,649.43	4.52	6.69
07/05	0.27	0.11	0.31	0.30	0.24	0.26	0.24	1,675.86	4.59	6.80
07/06	0.19	0.12	0.31	0.30	0.26	0.25	0.24	1,675.14	4.59	6.80
07/07	0.16	0.10	0.25	0.26	0.29	0.23	0.24	1,679.88	4.60	6.81
07/08	0.20	0.15	0.32	0.31	0.19	0.24	0.24	1,681.02	4.60	6.82
07/09	0.16	0.13	0.27	0.29	0.20	0.22	0.25	1,699.33	4.65	6.89
07/10	0.20	0.17	0.33	0.36	0.21	0.26	0.24	1,668.34	4.57	6.77
07/11	0.20	0.17	0.33	0.33	0.22	0.26	0.24	1,650.61	4.52	6.70
07/12	0.19	0.16	0.30	0.31	0.25	0.25	0.24	1,648.93	4.52	6.69
07/13	0.11	0.16	0.30	0.31	0.26	0.24	0.24	1,645.42	4.51	6.68
07/14	0.13	0.19	0.34	0.35	0.24	0.26	0.24	1,669.11	4.57	6.77
07/15	0.10	0.15	0.26	0.27	0.23	0.21	0.24	1,678.62	4.60	6.81
07/16	0.09	0.14	0.24	0.27	0.29	0.22	0.24	1,678.23	4.60	6.81
07/17	0.09	0.15	0.25	0.29	0.27	0.23	0.24	1,660.42	4.55	6.74
07/18	0.10	0.16	0.26	0.27	0.30	0.23	0.24	1,667.84	4.57	6.77
07/19	0.11	0.18	0.29	0.31	0.31	0.25	0.24	1,651.90	4.52	6.70
07/20	0.12	0.20	0.31	0.33	0.34	0.28	0.24	1,683.16	4.61	6.83
07/21	0.11	0.19	0.28	0.30	0.33	0.26	0.25	1,706.84	4.67	6.92
07/22	0.10	0.18	0.25	0.28	0.28	0.23	0.25	1,743.96	4.78	7.07
07/23	0.11	0.21	0.30	0.33	0.28	0.25	0.26	1,766.01	4.84	7.16
07/24	0.10	0.20	0.27	0.30	0.26	0.24	0.26	1,764.42	4.83	7.16
07/25	0.12	0.23	0.31	0.34	0.27	0.26	0.25	1,735.44	4.75	7.04
07/26	0.12	0.23	0.31	0.34	0.26	0.26	0.25	1,720.47	4.71	6.98
07/27	0.14	0.27	0.36	0.39	0.23	0.28	0.25	1,733.41	4.75	7.03
07/28	0.13	0.25	0.33	0.36	0.24	0.26	0.25	1,719.17	4.71	6.97
07/29	0.11	0.24	0.30	0.33	0.26	0.25	0.25	1,721.04	4.71	6.98
07/30	0.11	0.25	0.30	0.33	0.19	0.23	0.25	1,705.11	4.67	6.92
07/31	0.11	0.24	0.29	0.31	0.22	0.23	0.25	1,699.43	4.65	6.89
08/01	0.12	0.26	0.31	0.34	0.21	0.25	0.24	1,641.71	4.50	6.66
08/02	0.11	0.25	0.29	0.32	0.20	0.23	0.23	1,608.18	4.40	6.52
08/03	0.11	0.25	0.29	0.32	0.23	0.24	0.23	1,579.04	4.32	6.41
08/04	0.11	0.25	0.30	0.32	0.20	0.24	0.23	1,562.59	4.28	6.34
08/05	0.11	0.27	0.30	0.32	0.25	0.25	0.22	1,548.73	4.24	6.28
08/06	0.08	0.20	0.22	0.24	0.21	0.20	0.22	1,517.30	4.15	6.16
08/07	0.10	0.25	0.26	0.28	0.20	0.22	0.22	1,510.16	4.14	6.13
08/08	0.29	0.29	0.29	0.32	0.19	0.21	0.22	1,498.33	4.10	6.08
08/09	0.26	0.26	0.26	0.29	0.23	0.21	0.22	1,481.00	4.06	6.01
08/10	0.28	0.28	0.28	0.32	0.21	0.21	0.21	1,438.88	3.94	5.84
08/11	0.26	0.26	0.26	0.29	0.20	0.20	0.21	1,455.31	3.99	5.90
08/12	0.32	0.30	0.30	0.35	0.19	0.22	0.21	1,447.22	3.96	5.87
08/13	0.31	0.30	0.30	0.34	0.20	0.22	0.21	1,428.56	3.91	5.80
08/14	0.29	0.28	0.28	0.32	0.19	0.21	0.21	1,416.21	3.88	5.75
08/15	0.25	0.23	0.27	0.27	0.20	0.19	0.20	1,402.44	3.84	5.69
08/16	0.31	0.28	0.34	0.20	0.20	0.22	0.20	1,397.79	3.83	5.67
08/17	0.28	0.25	0.31	0.20	0.20	0.20	0.20	1,376.19	3.77	5.58
08/18	0.27	0.23	0.29	0.16	0.18	0.18	0.20	1,349.18	3.69	5.47
08/19	0.29	0.24	0.30	0.17	0.19	0.19	0.19	1,334.94	3.66	5.42
08/20	0.28	0.23	0.28	0.20	0.19	0.19	0.19	1,305.75	3.58	5.30
08/21	0.27	0.23	0.28	0.21	0.19	0.19	0.18	1,267.53	3.47	5.14
08/22	0.27	0.21	0.28	0.21	0.19	0.19	0.18	1,248.02	3.42	5.06
08/23	0.25	0.19	0.26	0.21	0.18	0.18	0.18	1,238.02	3.39	5.02
08/24	0.25	0.19	0.26	0.24	0.19	0.19	0.18	1,216.29	3.33	4.93

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	22,126 20%	11,063 10%	17,701 16%	28,764 26%	30,976 28%					
Date	ET-in/day									
Maximum	0.38	0.32	0.36	0.39	0.39	0.29	0.26	1,770.82	4.85	7.18
08/25		0.20	0.15	0.20	0.18	0.15	0.17	1,196.72	3.28	4.85
08/26		0.22	0.16	0.22	0.21	0.16	0.17	1,186.19	3.25	4.81
08/27		0.24	0.18	0.25	0.21	0.18	0.17	1,148.18	3.14	4.66
08/28		0.23	0.18	0.25	0.19	0.17	0.16	1,126.25	3.08	4.57
08/29		0.22	0.16	0.24	0.18	0.16	0.16	1,096.27	3.00	4.45
08/30		0.23	0.17	0.25	0.18	0.17	0.16	1,093.57	2.99	4.44
08/31		0.25	0.18	0.27	0.19	0.18	0.16	1,073.00	2.94	4.35
09/01		0.19	0.14	0.20	0.15	0.14	0.15	1,036.37	2.84	4.20
09/02		0.20	0.15	0.22	0.18	0.15	0.15	1,009.19	2.76	4.09
09/03		0.20	0.14	0.22	0.17	0.15	0.14	974.53	2.67	3.95
09/04		0.17	0.13	0.20	0.19	0.14	0.14	947.87	2.60	3.85
09/05		0.17	0.12	0.19	0.17	0.13	0.13	914.97	2.51	3.71
09/06		0.16	0.12	0.20	0.12	0.12	0.13	914.44	2.50	3.71
09/07		0.16	0.13	0.20	0.15	0.13	0.13	896.11	2.45	3.64
09/08		0.13	0.11	0.18	0.12	0.11	0.13	867.69	2.38	3.52
09/09		0.14	0.13	0.21	0.14	0.13	0.12	849.42	2.33	3.45
09/10		0.14	0.13	0.20	0.15	0.13	0.12	823.18	2.25	3.34
09/11		0.16	0.15	0.23	0.13	0.14	0.12	804.85	2.20	3.27
09/12		0.14	0.13	0.20	0.13	0.12	0.11	783.95	2.15	3.18
09/13		0.11	0.11	0.16	0.12	0.11	0.11	770.13	2.11	3.12
09/14		0.12	0.12	0.18	0.13	0.12	0.11	748.18	2.05	3.04
09/15		0.09	0.10	0.13	0.12	0.10	0.11	728.87	2.00	2.96
09/16		0.10	0.12	0.14	0.10	0.10	0.10	707.51	1.94	2.87
09/17		0.11	0.13	0.14	0.11	0.10	0.10	694.27	1.90	2.82
09/18		0.11	0.14	0.14	0.07	0.09	0.10	686.59	1.88	2.79
09/19		0.11	0.14	0.14	0.09	0.10	0.10	668.84	1.83	2.71
09/20		0.11	0.14	0.14	0.12	0.10	0.09	649.93	1.78	2.64
09/21		0.12	0.14	0.15	0.11	0.10	0.09	643.75	1.76	2.61
09/22		0.11	0.14	0.14	0.13	0.11	0.09	643.79	1.76	2.61
09/23		0.10	0.13	0.13	0.10	0.09	0.09	647.81	1.77	2.63
09/24		0.11	0.14	0.14	0.07	0.09	0.09	652.65	1.79	2.65
09/25		0.07	0.09	0.09	0.08	0.07	0.09	640.82	1.75	2.60
09/26		0.10	0.12	0.12	0.09	0.09	0.09	617.16	1.69	2.50
09/27		0.11	0.16	0.16	0.08	0.10	0.09	595.26	1.63	2.41
09/28		0.10	0.14	0.14	0.10	0.10	0.08	581.18	1.59	2.36
09/29		0.12	0.17	0.15	0.08	0.10	0.08	556.97	1.53	2.26
09/30		0.09	0.13	0.11	0.09	0.08	0.08	559.16	1.53	2.27
10/01		0.07	0.10	0.07	0.10	0.07	0.08	546.84	1.50	2.22
10/02		0.07	0.10	0.08	0.11	0.07	0.08	531.44	1.46	2.16
10/03		0.08	0.11	0.09	0.09	0.07	0.07	509.72	1.40	2.07
10/04		0.06	0.10	0.08	0.05	0.06	0.07	486.05	1.33	1.97
10/05		0.07	0.12	0.10	0.07	0.07	0.07	467.40	1.28	1.90
10/06		0.07	0.12	0.08	0.08	0.07	0.07	455.41	1.25	1.85
10/07		0.08	0.13	0.09	0.08	0.08	0.06	443.21	1.21	1.80
10/08		0.08	0.13	0.10	0.03	0.06	0.06	431.87	1.18	1.75
10/09		0.08	0.13	0.11	0.04	0.07	0.06	435.38	1.19	1.77
10/10		0.07	0.12	0.09	0.03	0.06	0.06	408.71	1.12	1.66
10/11		0.04	0.06	0.05	0.09	0.05	0.06	401.50	1.10	1.63
10/12		0.06	0.09	0.07	0.06	0.06	0.06	386.45	1.06	1.57
10/13		0.06	0.10	0.08	0.06	0.06	0.05	378.39	1.04	1.54
10/14		0.07	0.11	0.08	0.06	0.06	0.05	363.43	1.00	1.47
10/15		0.02	0.04	0.03	0.06	0.03	0.05	356.62	0.98	1.45
10/16		0.03								
10/17		0.02								
10/18		0.07								
10/19		0.05								
10/20		0.05								



