

Volume I
Planning Report and
Final Environmental Impact Statement
(Includes Appraisal-Level Alternative Designs and Cost Estimates)

Navajo-Gallup Water Supply Project

New Mexico – Arizona



Navajo Nation



City of Gallup



Jicarilla Apache Nation



U.S. Department of the Interior
Bureau of Reclamation

July 2009

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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PLANNING REPORT AND FINAL ENVIRONMENTAL IMPACT STATEMENT

NAVAJO-GALLUP WATER SUPPLY PROJECT NEW MEXICO – ARIZONA

**Prepared by the U.S. Department of the Interior, Bureau of Reclamation,
Upper Colorado Region, Salt Lake City, Utah**

This planning report and final environmental impact statement (PR/FEIS) for the Navajo-Gallup Water Supply Project has been prepared by the Bureau of Reclamation in compliance with the National Environmental Policy Act.

A number of project alternatives, consisting of both structural and nonstructural components, are evaluated in this PR/FEIS. Information on hydrology, water quality, endangered species, wildlife, geology, paleontology, soils, wetlands, cultural resources, recreation, social economic issues, environmental justice, Indian Trust Assets, and the San Juan River Basin Recovery Implementation Program is included.

Cooperating agencies that participated in the development of this PR/FEIS include:

Bureau of Indian Affairs	Navajo Nation
City of Gallup	Navajo Tribal Utility Authority
Indian Health Service	Northwest New Mexico Council of Governments
Jicarilla Apache Nation	State of New Mexico

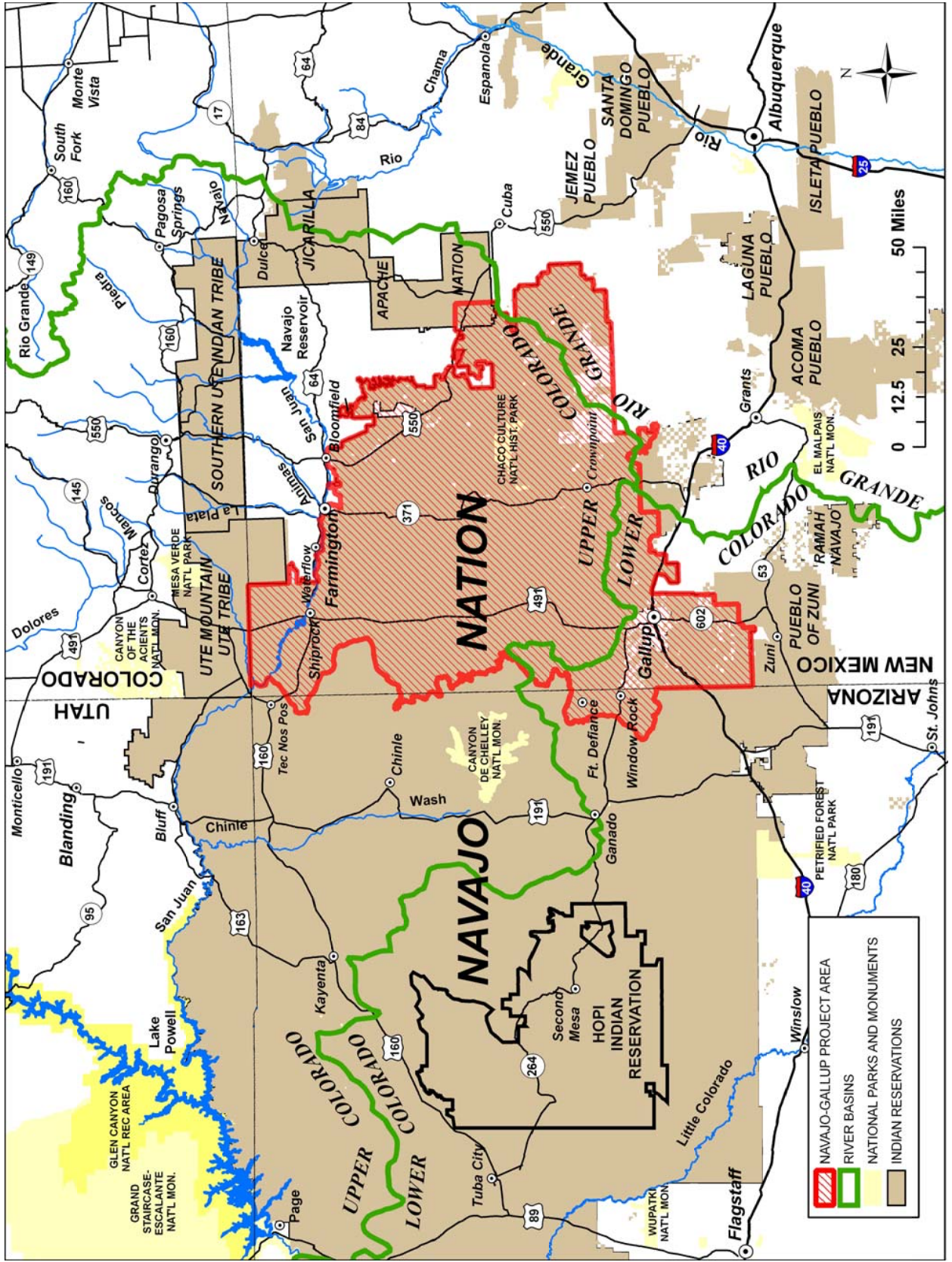
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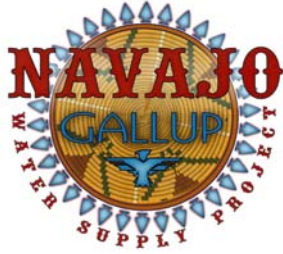
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- NAVAJO-GALLUP PROJECT AREA
- RIVER BASINS
- NATIONAL PARKS AND MONUMENTS
- INDIAN RESERVATIONS





ACRONYMS AND ABBREVIATIONS

A

ACHP	Advisory Council on Historic Preservation
ADWR	Arizona Department of Water Resources
AFY	acre-feet per year
ALP	Animas-La Plata

B

Basin	San Juan River Basin
BIA	Bureau of Indian Affairs
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	Best Management Practices

C

CAA	Clean Air Act
CAP	Central Arizona Project
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNG	compressed natural gas
Colorado Ute Settlement Act	Colorado Ute Indian Water Rights Settlement Act of 1988, P.L. 100-585, as amended (P.L. 106-554)
Commission	Upper Colorado River Commission
Construction Plan	Mesa Verde Cactus Construction Plan
CPUE	catch-per-unit effort
CRSP	Colorado River Storage Project
CWA	Clean Water Act

D

DBPs disinfection byproducts
DEIS draft environmental impact statement

E

ECP Environmental Commitments Plan
EIS environmental impact statement
EPA Environmental Protection Agency
EQ environmental quality
ESA Endangered Species Act
ESRI Ecosystem Research Institute

F

FEIS final environmental impact statement
FSEIS final supplemental environmental impact statement
FWCA Fish and Wildlife Coordination Act

G

gpcd gallons per capita per day
GIS geographic information system
g/m² grams per square meter

H

HTCPO Hopi Tribe Cultural Preservation Office
HVAC heating, ventilation, and air conditioning

I

IGS Infiltration Gallery System
IHS Indian Health Service
Indian American Indian
Interior Department of the Interior
IRM Office of Integrated Resource Management
ITAs Indian Trust Assets

J

JANNRWSP	Jicarilla Apache Nation Navajo River Water Supply Project
JGFD	Jicarilla Game and Fish Department
Jicarilla Settlement Act	Jicarilla Apache Tribe Water Rights Settlement Act

K

kW	kilowatt
kV	kilovolt

L

LCP	local control panel
LPG	liquefied petroleum gas

M

M&I	municipal and industrial
MAF	million acre-feet
MCL	maximum contaminant level
MGD	million gallons per day
mg/L	milligrams per liter
$\mu\text{g/L}$	micrograms per liter
MHI	median household income
MOA	Memorandum of Agreement
mW	megawatt

N

NAGPRA	Native American Graves Protection and Repatriation Act
NAPI	Navajo Agricultural Products Industry
<i>National Register</i>	<i>National Register of Historic Places</i>
Navajo Settlement Agreement	San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement
NED	national economic development
NEPA	National Environmental Policy Act
NESA	Navajo Nation Endangered Species Act
NFWD	Navajo Fish and Wildlife Department
NHPA	National Historic Preservation Act
NIIP	Navajo Indian Irrigation Project
NMDGF	New Mexico Department of Game and Fish
NMDPR	New Mexico Department of Parks and Recreation
NMISC	New Mexico Interstate Stream Commission

NMNHP	New Mexico Natural Heritage Program
NMRGISP	New Mexico Resource Geographic Information System Program
NMRPTC	New Mexico Rare Plant Technical Council
NMSHPO	New Mexico State Historic Preservation Officer
NNDFW	Navajo Nation Department of Fish and Wildlife
NNHP	Navajo Natural Heritage Program
NNMP	Navajo Nation Municipal Pipeline
NNPRD	Navajo Nation Parks and Recreation Department
NNTHPO	Navajo Nation Tribal Historic Preservation Officer
NOA	Notice of Availability
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NTU	Nestler Turbidity Units
NTUA	Navajo Tribal Utility Authority

O

O&M	operation and maintenance
OM&R	operation, maintenance, and replacement
OPS	Office of Pipeline Safety
OSE	other social effects

P

PIA	practicably irrigable acreage
P.L.	Public Law
Plains Electric	Plains Electric Generation and Transmission Cooperative, Inc.
PNM	Public Service Company of New Mexico
ppm	parts per million
PR/DEIS	planning report and draft environmental impact statement
PR/FEIS	planning report and final environmental impact statement
<i>Principles and Guidelines</i>	<i>Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies</i>
proposed project	Navajo-Gallup Water Supply Project
psi	pounds per square inch

R

Reclamation	Bureau of Reclamation
RED	regional economic development
RM	river mile
ROD	Record of Decision
ROW	rights-of-way

RPA reasonable and prudent alternative
RPM reasonable and prudent measures

S

SDWA Safe Drinking Water Act
Secretary Secretary of the Interior
Service U.S. Fish and Wildlife Service
SHPO State Historic Preservation Officer
Sithe Global Sithe Global Power, LLC
SJRPNM San Juan River Public Service Company of New Mexico
SJRBRIP San Juan River Basin Recovery Implementation Program
SLO New Mexico State Land Office
SSURGO Soil Survey Geographic (database)
SWTR Surface Water Treatment Rule

T

TCP traditional cultural properties
TDS total dissolved solids
THPO Tribal Historic Preservation Officer
TMDL total maximum daily load
TOC total organic carbon
TSC Technical Service Center

U

UMTRA Uranium Mill Tailings Remedial Action
U.S.C. United States Code
USGS U.S. Geological Survey
UV ultraviolet



EXECUTIVE SUMMARY

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INTRODUCTION

The Bureau of Reclamation (Reclamation) has developed this planning report and final environmental impact statement (PR/FEIS) pursuant to Public Law (P.L.) 92-199 and the general authority to conduct water resources planning under the Reclamation Act of 1902 and all acts amendatory thereof and supplementary thereto. This document was undertaken to provide a discussion on (1) various ways to provide a municipal and industrial (M&I) water supply to the Navajo Nation, city of Gallup, and the Jicarilla Apache Nation and (2) the associated potential environmental impacts and costs of such an endeavor.

The Navajo-Gallup Water Supply Project (proposed project) authorization was included in the recently enacted Omnibus Public Land Management Act of 2009, Title X, Part III (P.L. 111-11, March 30, 2009). The act authorizes the Secretary of the Interior (Secretary) to:

1. Construct, operate, and maintain the proposed project
2. Allocate the capacity of the proposed project among the Navajo Nation, Jicarilla Apache Nation, and the city of Gallup
3. Enter into proposed project repayment contracts with the city of Gallup and the Jicarilla Apache Nation

In general, the Secretary, acting through the Commissioner of Reclamation, is authorized to design, construct, operate, and maintain the proposed project in substantial accordance with the preferred alternative in the draft environmental impact statement.

The Omnibus Public Land Management Act of 2009 (P.L. 111-11) approved, ratified, and confirmed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (Navajo Settlement Agreement) under Title X, Part IV of the act. This PR/FEIS does not analyze the Navajo Settlement Agreement; however, the act requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010.

The cost analysis contained in this PR/FEIS is based on an appraisal level of analysis. The cost estimate of the preferred alternative identified in this report reflects prices as of January 2007 and is known as Reclamation's April 2007 construction cost estimate.

PURPOSE AND NEED

The proposed project is to provide long-term (year 2040) supply, treatment, and transmission of M&I water to the Navajo Nation, the Jicarilla Apache Nation, and the city of Gallup, New Mexico.

A long-term sustainable water supply is needed for the area to support current and future populations. The proposed project would be designed to serve a future population of approximately 250,000 people by the year 2040. Existing groundwater supplies are dwindling, have limited capacity, and are of poor quality. More than 40 percent of Navajo households rely on water hauling to meet daily water needs. The city of Gallup's groundwater levels have dropped approximately 200 feet over the past 10 years, and the supply is not expected to meet current water demands within the decade. The Jicarilla Apache people are currently not able to live and work outside the Town of Dulce on the reservation because of a lack of water supply (Reclamation, 2001).

THE NAVAJO-GALLUP WATER SUPPLY PROJECT

The proposed project would convey a reliable M&I water supply to the eastern section of the Navajo Nation, the southwestern part of the Jicarilla Apache Nation, and the city of Gallup via diversions from the San Juan River in northern New Mexico. The Navajo Nation, city of Gallup, and the Jicarilla Apache Nation are part of the project steering committee that assisted in preparation of portions of this document.

Navajo Nation communities and the city of Gallup rely on a rapidly depleting groundwater supply that is inadequate to meet present needs and anticipated growth. Other water sources are needed to meet current and future M&I demands of more than 43 Navajo chapters, including the communities of Fort Defiance and Window Rock in Arizona, the city of Gallup, and the Teepee Junction area of the Jicarilla Apache Nation.

The proposed project is designed to divert a total of 37,764 acre-feet of water per year from the San Juan River, with a resulting depletion of 35,893 acre-feet, based on 2040 projected population with a demand rate of 160 gallons per capita per day (gpcd). The Cutter diversion would require 4,645 acre-feet per year with no return flow to the San Juan River. The PNM diversion would take the remaining 33,119 acre-feet of diversion, with an average return flow of 1,871 acre-feet. Based on the expected populations in the year 2040, the proposed project would serve approximately 203,000 people in 43 chapters in the Navajo Nation, 1,300 people in the Jicarilla Apache Nation, and approximately 47,000 people in the city of Gallup.

PLANNING PROCESS

Project planning has been intermittent over the past 40 years. Drawing from past analysis and projecting water needs and environmental conditions into the next 40 years has provided the basis for the planning work described in this report.

A project steering committee included representatives from the Navajo and Jicarilla Apache Nations, city of Gallup, State of New Mexico, Bureau of Indian Affairs (BIA), Indian Health Service (IHS), Navajo Tribal Utility Authority (NTUA), Northwest New Mexico Council of Governments, and Reclamation. The steering committee was formed in the early 1990s to guide the direction of this proposed project, provide technical analysis, support public involvement, provide political background, and conduct overall project coordination. Reclamation has provided planning, engineering, and environmental expertise to this committee.

Funding for project planning has mostly been through annual congressional write-in funds and cost sharing by the Navajo and Jicarilla Apache Nations and the city of Gallup. The level of analysis—appraisal versus feasibility level work—has been tailored to stay within the funds available.

To expedite planning and environmental steps, it was decided that this document would be a combined PR/FEIS. This document complies with the *Economic Principles and Guidelines for Water and Related Land Resources Implementation Studies (Principles and Guidelines)* and the National Environmental Policy Act (NEPA).

The NEPA process began with a Notice of Intent published in the *Federal Register* on March 27, 2000. Scoping meetings were held at five locations in April and May 2000: Crownpoint, Gallup, Shiprock, and Farmington, New Mexico; and Saint Michaels, Arizona. The Notice of Availability of the planning report and draft environmental impact statement (PR/DEIS) was published on March 30, 2007, in the *Federal Register*. The 90-day comment period was from March 30, 2007, to June 28, 2007. Public hearings were held at the same five locations as the scoping meetings in May and June 2007. The meetings were moderately attended, with a range of 15 to 50 people each. The most widespread comments indicated that there is a great need for a reliable M&I water supply throughout the proposed project area, that existing groundwater is in limited supply, and that the water is usually of poor quality.

In November 2007, several sections of the PR/DEIS were updated in a report entitled *Cost and Economic Update to 2007 Prices of the Planning Report and Draft Environmental Impact Statement*. All entities on the mailing list were either sent copies of the cost and economic update report or postcards notifying them of the report's availability. The updated cost and economic information is included in this PR/FEIS.

During the proposed project planning process, the Navajo and Jicarilla Apache Nations and the city of Gallup provided their current and projected population estimates and associated M&I water needs to year 2040. An estimated water use rate of 160 gallons per day per person was used for the proposed project design, as requested by the Navajo and Jicarilla Apache Nations.¹ It was assumed that available groundwater would continue to be used and that project water would meet the remaining need. The steering committee identified possible alternatives to meet current and future water needs. It was determined in all past studies, as well as in this study, that the San Juan River was the only sustainable source of water. Therefore, all the viable alternatives involved treating river water for use throughout the proposed project area.

It was determined that water conservation is currently well established in the proposed project area, and although additional conservation would reduce water use, it would not be enough to provide for future water needs. It was assumed that water conservation would continue with all project alternatives considered. Six physically different, viable alternatives were identified to bring San Juan River water to the proposed project area. All of the alternatives would provide the same quantity of treated water to the same delivery locations. The variables included where the water would be diverted and the location of the alternatives' facilities. Maximizing the use of existing facilities and information were important factors in the design of the alternatives. All of the alternatives use Navajo Reservoir and Navajo Indian Irrigation Project (NIIP) facilities to some extent and have the same Gallup Regional System supplying water to the city of Gallup and surrounding Navajo chapters.

¹ The city of Gallup uses 160 gpcd for current and future demand projections. The Navajo Tribal Utility Authority's current average water use rate is 100 gpcd.

Four of the alternatives obtain all of the water from Navajo Reservoir and the NIIP facilities:

- NIIP Moncisco Alternative
- NIIP Coury Lateral Alternative
- NIIP Cutter Alternative
- NIIP Amarillo Alternative

The other two alternatives have a San Juan River diversion in addition to the diversion from the NIIP:

- San Juan River Public Service Company of New Mexico (SJRPNM) Alternative
- San Juan River Infiltration Alternative

Table ES-1 shows the major features of each alternative.

Table ES-1.—General summary of components

Component	NIIP Moncisco Alternative	NIIP Coury Lateral Alternative	NIIP Cutter Alternative	NIIP Amarillo Alternative	SJRPNM Alternative	San Juan River Infiltration Alternative
River intake					1	
Infiltration wells						26 (year 2040)
River pumping plant					1	
Treatment plants	1	1	1	2	2	2
Forebay tanks	12	8	11	17	19	20
Pumping plants	12	8	11	17	20	20
Regulating tanks	5	5	5	6	5	5
Community storage tanks	20	20	20	20	20	20
Feet of pipeline	1,361,954	1,389,378	1,466,248	1,286,082	1,237,792	1,189,145
Miles of pipeline	258	263	278	244	234	225
Gallup Regional System						
Pumping plants	4	4	4	4	4	4
Community storage tanks	5	5	5	5	5	5
Feet of pipeline	171,923	171,923	171,923	171,923	171,923	171,923
Miles of pipeline	32.6	32.6	32.6	32.6	32.6	32.6

ALTERNATIVE SCREENING PROCESS

The six viable alternatives were compared using nine factors derived from the four accounts described in the *Principles and Guidelines*. The SJRPNM Alternative surfaced as the highest-ranked (best) alternative considering all of the factors. When considering only environmental factors, the SJRPNM Alternative again ranked the highest (least environmentally impacting). When considering only capital and annual operation, maintenance, and replacement (OM&R) costs as measured by present worth, the SJRPNM Alternative was least costly assuming Colorado River Storage Project (CRSP) power rates. When locally available power rates from the NTUA were used, the NIIP Amarillo Alternative was the least costly.

A detailed analysis of environmental impacts associated with the SJRPNM and NIIP Amarillo Alternatives and the No Action Alternative was completed in this document. This analysis concluded that the SJRPNM Alternative would have fewer impacts to most resource factors compared to the other alternatives. For this reason, the SJRPNM Alternative has been identified as the preferred alternative considering all the factors and resources evaluated.

PREFERRED ALTERNATIVE

The SJRPNM Alternative would divert water from the San Juan River downstream of Fruitland, New Mexico, just above the existing Public Service Company of New Mexico (PNM) diversion structure, treat the water to drinking water standards, and then deliver it along Highway N36 and south to Navajo chapters along U.S. Highway 491. Water would be provided to Window Rock, Arizona, and Crownpoint, New Mexico, through sublaterals. Water would also be provided to the city of Gallup, New Mexico, through the Gallup Regional System. Another diversion would originate at Cutter Reservoir, an existing regulating reservoir on the NIIP, and would convey water to the eastern portion of the Navajo and Jicarilla Apache Nations.

The construction cost of this alternative is estimated to be \$864,400,000 (Reclamation, April 2007 cost estimate, table ES-2). The annual OM&R costs for the preferred alternative are projected as shown in table ES-3.

The appraisal-level design and cost estimate was done by Reclamation's Technical Service Center. The design and cost estimate was peer reviewed by an independent engineering consulting firm, Boyle Engineering. Revisions were made to the estimate based on the review, and the contingency factor was increased. This estimate represents the level at which this project could be constructed with January 2007 price levels. This assumes that no unknown factors were encountered or changes made.

Table ES-2.—Preferred alternative cost estimate

Feature	Reclamation April 2007 ¹ cost estimate (\$)
Pipelines	202,546,620
Pumping plants	28,355,000
Water treatment plants	53,673,055
Tanks and air chambers	85,575,000
Transmission lines	26,677,200
Turnout structure	1,707,380
Gallup Regional System	25,754,500
<i>Subtotal</i>	424,288,755
Mobilization (5%)	21,000,000
Unlisted items (10%)	44,711,245
<i>Subtotal</i>	490,000,000
Contingencies (22.5%)	110,000,000
<i>Subtotal (field costs)</i>	600,000,000
Noncontract costs (27%)	162,000,000
<i>Subtotal</i>	762,000,000
New Mexico taxes on field costs (estimated at 6%)	36,000,000
Navajo Nation taxes on field costs, excluding Gallup Regional System field cost of \$30 million (estimated at 3%)	16,900,000
<i>Subtotal</i>	814,900,000
Land, relocation, and damage ²	9,000,000
Cultural resource mitigation	34,500,000
Environmental mitigation	6,000,000
Total project cost	864,400,000

¹ The cost analysis contained in this PR/FEIS is at an appraisal level using January 2007 prices, and it was completed before project authorization (P.L. 111-11) was enacted. Public Law 111-11 authorizes \$870 million of appropriations, plus indexing, for the proposed project. It also limits the Secretary to not more than 2 percent of construction costs for cultural resource mitigation costs. This limitation would reduce the above costs by \$17.5 million. The proposed project is now authorized, and more refined construction cost estimates will be prepared in the future with more detailed design data. Therefore, for this PR/FEIS, previously developed cost estimates will be used (the change described above is within the range of accuracy for the total cost estimate and the effort required to make numerous, small revisions is not warranted at this level of study).

² The estimate includes right-of-way (ROW) costs for the San Juan Treatment Plant only; should it be determined that additional ROW needs to be included, additional funds will be necessary.

Table ES-3.—Yearly OM&R costs (\$) (SJRPNM Alternative)

Item	San Juan Lateral	Cutter Lateral	Gallup Regional System
NTUA power costs (relift pumping plant)	4,962,000	597,000	82,000
CRSP power costs (relift pumping plant)	1,841,000	221,000	31,000
NTUA power costs (booster pumping plant)	215,000	35,000	
CRSP power costs (booster pumping plant)	80,000	13,000	—
Relift pumping plant OM&R	3,170,000	1,245,000	723,000
Booster pumping plant OM&R	78,000	12,000	
Canal OM&R	—	35,000	—
NTUA power cost water treatment plant	511,000	63,000	—
CRSP power cost water treatment plant	187,000	22,000	—
Water treatment OM&R	2,605,000	\$1,064,000	—
NTUA water treatment, miscellaneous 10%	312,000	\$113,000	
CRSP water treatment, miscellaneous 10%	279,000	\$109,000	
Power transmission OM&R	350,000	Included in San Juan Lateral	
Pipeline OM&R	801,000	187,000	57,000
Total NTUA	13,004,000	3,351,000	862,000
Total CRSP	9,391,000	2,908,000	811,000

Notes: (1) CRSP rate is 10.43 mils per kilowatthour and demand charge of \$4.43 per kilowatt per month.
(2) CRSP total project power cost is \$2,395,000.
(3) NTUA rate is 20 mils per kilowatthour and demand charge of \$16.50 per kilowatt per month.
(4) NTUA total project power cost is \$6,465,000.
(5) Cost reflects April 2007 project cost estimate with January 2007 price level.

WATER SUPPLY

Water for the Navajo Nation's use in New Mexico would be supplied from the State of New Mexico's Upper Basin apportionment, and water for the Navajo Nation use in Arizona would be supplied from the consumptive use apportionments made to the State of Arizona by compact or decree. Navajo Nation uses by the proposed project in both

States must be serviced through long-term water supply contracts between the Secretary and the Navajo Nation. The Secretary would make the water available for contract deliveries under existing New Mexico permits that the Secretary holds.

Jicarilla Apache Nation water would come from Navajo Reservoir as part of the water obtained through the Jicarilla Apache Nation Water Right Settlement.² The Jicarilla Apache Nation has an existing water supply contract for this water. It is anticipated that the city of Gallup would contract through the Jicarilla Apache Nation and/or Navajo Nation for its water supply. A long-term water supply subcontract among the Jicarilla Apache Nation and/or Navajo Nation, the city of Gallup, and Reclamation would be needed to finalize this arrangement.

ECONOMIC AND FINANCIAL ANALYSIS

The economic analysis compares project benefits measured by willingness to pay and cost of alternative source of water to project cost. The benefit to cost ratio is 1.25, which represents a beneficial use of national resources. The financial analysis addresses the cost of project water delivered to the users. The levelized cost of project water to the user is estimated to be \$7.57 per thousand gallons. This compares with \$5.50 per thousand gallons for the Lewis and Clark Project and \$8.30 per thousand gallons for the Rocky Boy's/North Central Montana Regional System, both of which are authorized Federal rural water projects. The analysis presented in this PR/FEIS is based on the identified preferred alternative.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Positive impacts would occur from implementing the preferred alternative. The average flow in the San Juan River would be increased by approximately 5 cubic feet per second between Navajo Dam and the SJRPNM diversion to meet proposed project demands. This increase would also provide additional dilution for water quality improvement and would improve the habitat for fish (including the tailwater trout fishery). Indian Trust Assets could be put to use by providing the Navajo and Jicarilla Apache Nations a water supply system. The socioeconomic resources would be improved by providing up to 650 jobs during construction and boosting the income to the region. An M&I water supply would help boost the overall economic growth to the region.

² Jicarilla Apache Nation water rights were specified in the 1992 Jicarilla Apache Tribe Water Rights Settlement Act (P.L. 102-441).

Negative impacts associated with construction of such a large project are unavoidable. They consist of a permanent loss of 43 acres of vegetation and associated wildlife habitat, including 1.1 acres of permanent loss of wetlands. There would be potential entrainment losses at the PNM diversion for flannelmouth sucker and speckled dace larva. Forty-three acres of private and Navajo Nation lands would be converted to project use by the alternative. Six families who currently live on the private land would be relocated. There would be a temporary impact to grazing on Navajo Nation lands during construction.

Special status species would be impacted due to the potential entrainment losses at the SJRPNM diversion for Colorado pikeminnow, razorback sucker, and bluehead sucker. There are also potential negative impacts to the beautiful gilia and Mesa Verde cactus along the pipeline alignment.

Cultural resources could be potentially adversely impacted since there are an estimated 104 cultural resource sites within the area of potential effects. Approximately 90 sites could require treatment.

Mitigation measures addressing these potential impacts have been developed and are included in the preferred alternative design and cost estimate.

CONSULTATION AND COORDINATION

Reclamation, as the lead agency responsible for preparation of this PR/FEIS, used an interdisciplinary team to prepare the document in addition to representatives from the Navajo and Jicarilla Apache Nations and city of Gallup staff and consultants. In addition, the BIA, IHS, NTUA, State of New Mexico, and the Northwest New Mexico Council of Governments participated with the interdisciplinary team in preparing this document.

Reclamation and the U.S. Fish and Wildlife Service (Service) have consulted, both formally and informally, regarding potential impacts to special status species as a result of potential development and operation of the preferred alternative.

A biological assessment was developed by Reclamation, and the Service issued a biological opinion under the Endangered Species Act. In the biological opinion, the Service concluded that the proposed project, as described in the biological assessment and in this PR/FEIS, is not likely to jeopardize the continued existence of the Colorado pikeminnow or razorback sucker and is not likely to adversely modify their designated critical habitat. The biological opinion contains an incidental take statement for Colorado pikeminnow and razorback sucker larvae that may become entrained as a result of the

diversion from the San Juan River. Mesa Verde cactus also may be directly taken during the construction of project features. The biological opinion incorporates conservation measures to minimize impacts to Mesa Verde cactus.

The biological opinion incorporates a Navajo Depletion Guarantee, which limits new depletion associated with the project to 5,271 acre-feet at full development (see chapter VI and volume II, appendix C, part III). The biological opinion concludes that the 5,271 acre-feet of new depletions associated with the proposed project would not adversely impact the Colorado pikeminnow or razorback sucker. However, because larval fish may be lost due to the project diversions, the fish would be adversely affected. The biological opinion identifies the reasonable and prudent measure to be implemented by Reclamation and the San Juan River Basin Recovery Implementation Program to reduce incidental take of Colorado pikeminnow and razorback sucker. It also states that if reinitiation is required, the Service will follow the procedures regarding reinitiation of consultation pursuant to the “Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin” (see attachment O).

A Planning Aid Memorandum and Fish and Wildlife Coordination Act report have also been prepared by the Service, and the recommendations are included, where appropriate, in the preferred alternative plan (see volume II, appendix C, part III).



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Attachments

Attachment

- A** Memorandum of Agreement between the City of Gallup and the Navajo Nation to Cooperate on the Navajo-Gallup Water Supply Project (IGRF-33-98)
- B** Memorandum of Understanding between the Navajo Nation and the City of Gallup Concerning Water Supplies for the Navajo-Gallup Water Supply Project (October 2007)
- C** Resolution of the Resources Committee of the Navajo Nation Council
- D** Resolutions of the Navajo Nation Chapters
- E** Resolutions of the Upper Colorado River Commission
- F** Letter from Jicarilla Apache Tribe to the Bureau of Reclamation (February 16, 2001)
- G** Letter from Honorable Kelsey A. Begaye, President of the Navajo Nation, and Honorable John Peña, Mayor of the city of Gallup, to Eluid Martinez, Commissioner of the Bureau of Reclamation (November 22, 2000)
- H** Letters from Eluid L. Martinez, Commissioner of the Bureau of Reclamation (December 26, 2000), and Rick L. Gold, Regional Director, Upper Colorado Regional Office, to Honorable Kelsey A. Begaye, President of the Navajo Nation, and Honorable John Peña, Mayor of the city of Gallup (June 13, 2001)
- I** Preferred Alternative
- J** Screening Report
- K** Vegetation
- L** List of Wildlife Found in the Project Area and Habitat Associations
- M** Soil and Geology Descriptions
- N** Hydrologic Determination, 2007, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico

Attachments (continued)

Attachment

- O** Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin

- P** Northwestern New Mexico Rural Water Projects Act (Public Law 111-11, title X, subtitle B)

Under separate cover:

- Volume II** Technical Appendices for the Planning Report and Final Environmental Impact Statement

- Volume III** Comments and Responses for the Planning Report and Final Environmental Impact Statement



Chapter I

INTRODUCTION

Purpose of and Need for the Proposed Project
The Proposed Project
Scope
Proposed Project Authorization, Related Agreements, and Resolutions
Cooperating Agencies, Public Involvement, and Scoping
Previous Studies
Other Projects and Actions in the San Juan River Basin
Water Rights Background
Responsibilities and Compliance
Document Review
Document Organization

PURPOSE OF AND NEED FOR THE PROPOSED PROJECT

The purpose of the Navajo-Gallup Water Supply Project (proposed project) is to provide the long-term (year 2040) supply, treatment, and transmission of municipal and industrial (M&I) water to the eastern part of the Navajo Nation, the Jicarilla Apache Nation, and the city of Gallup, New Mexico. The Federal action is to construct, operate, and maintain a water supply system that meets projected year 2040 water demand. The Bureau of Reclamation (Reclamation) is authorized to construct, operate, or maintain facilities proposed in this document. This authorization was included in the recent Omnibus Public Land Management Act of 2009 (Public Law [P.L.] 111-11).

A long-term (year 2040) sustainable water supply is needed for the Navajo and Jicarilla Apache Nations and the city of Gallup to support the current and future populations. The existing groundwater supplies are dwindling and have limited capacity.

THE PROPOSED PROJECT

The project proposes to convey a reliable M&I water supply to the eastern section of the Navajo Nation, the southwestern part of the Jicarilla Apache Nation, and the city of Gallup, New Mexico, via diversions from the San Juan River in northern New Mexico. The Navajo Nation, city of Gallup, and Jicarilla Apache Nation are cooperating project participants.

Navajo Nation communities and the city of Gallup rely on a rapidly declining groundwater supply that is inadequate to meet present and projected needs to the year 2040. Other water sources are needed to meet current and future M&I demands of more than 43 Navajo chapters,¹ the city of Gallup, the Navajo Agricultural Products Industry (NAPI), and the Teepee Junction area of the Jicarilla Apache Nation.

The proposed project would deplete approximately 35,893 acre-feet of water annually from the San Juan River for M&I use. Based on the expected populations in the year 2040, Reclamation estimates that the proposed project would serve approximately 203,000 people in 43 chapters in the Navajo Nation, 1,300 people in the Jicarilla Apache Nation, and approximately 47,000 people in the city of Gallup.

This planning report and final environmental impact statement (PR/FEIS) examines six structural alternative plans for achieving water delivery, as well as a non-structural Water Conservation Alternative for the proposed project. It describes the way in which the plans were formulated and evaluated, includes appraisal-level designs and cost estimates, and discloses the environmental impacts of the No Action Alternative and two action alternatives, as required by the National Environmental Policy Act (NEPA). It also meets the guidelines and requirements of other laws and mandates cited at the end of this chapter.

The ultimate objective of the planning effort in this project is to develop an economically, technically, socially, and environmentally acceptable plan that would provide for present and future water supply needs in the area. The steps necessary to attain this goal are to:

- Delineate present conditions
- Estimate growth and future water demands
- Determine the capability of water resources to meet the needs
- Formulate and weigh alternative plans
- Select a proposed plan

The proposed project would also facilitate self-governance and sovereignty goals of the Jicarilla Apache and Navajo Nations.

¹ Navajo Nation chapters are centers of local government. The Navajo Nation is divided into 110 chapters.

SCOPE

The general project area is on the west slope of the Continental Divide and is within the drainage basins of the Rio Grande and Upper and Lower Colorado Rivers. Figure I-1 depicts the proposed project boundaries at a Navajo chapter-level scale and specific locations.

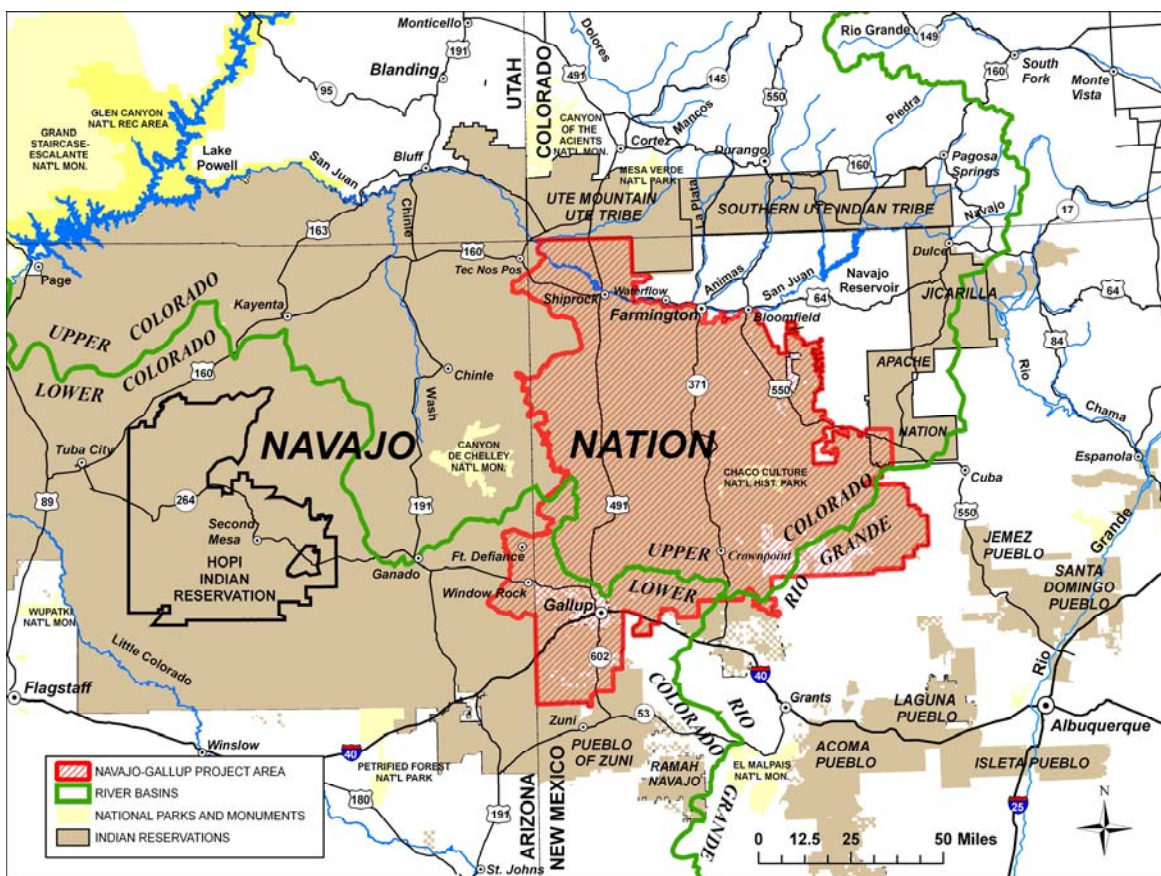


Figure I-1.—Proposed project area.

The Navajo Nation Reservation lands portion of the proposed project area is bounded generally on the west by the New Mexico/Arizona State line, with small parts of the proposed project in Arizona near Teec Nos Pos to the north and Fort Defiance/Window Rock to the south; on the north by the Colorado/New Mexico State line to a point roughly above Waterflow, New Mexico, then south to the San Juan River and eastward to a point

near Bloomfield, New Mexico; on the east by U.S. Highway 550 to approximately Counselor, New Mexico; and on the south from a point westward into Arizona near Window Rock, with a dip south of Manuelito to include the city of Gallup.

The Jicarilla Apache Nation Reservation lands portion of the proposed project area is bounded generally on the south and west by U.S. Highway 550 and then north parallel to State Highway 537, on the north by the main reservation, and on the east by the Mundo Ranch area.

The Proposed Project Area

Navajo Nation

The Navajo Nation Reservation was established in 1868 and has been expanded through a series of Executive orders to become the largest American Indian (Indian) reservation in the United States. The Navajo Nation encompasses 26,897 square miles within the States of Arizona, New Mexico, and Utah, constituting an area larger than the State of West Virginia. According to the U.S. Census Bureau (2000), on-reservation population was 181,000, and, nationwide, approximately 300,000 people indicated they were Navajo. The Navajo have a high level of poverty, with more than 56 percent having incomes below the poverty level and a reservation unemployment rate of 54 percent (Rodgers, 1995).

Jicarilla Apache Nation

The Jicarilla Apache Nation is located in north-central New Mexico and includes approximately 742,800 acres. Additional private parcels of land adjacent to the reservation have been acquired by the Jicarilla Apache Nation in recent years, resulting in 97,000 acres being added to the reservation through trust acquisition actions by Congress. The Jicarilla Apache Nation is by far the largest employer of its people, providing social services and management of its natural resources. Tribal unemployment rates are about 16.6 percent in the summer and 28.7 percent in the winter (Jicarilla Apache Nation, 1998).

City of Gallup

The city of Gallup is the county seat of McKinley County, New Mexico, and is the economic center for a 15,000-square-mile trade area. The city is located on two major highways—Interstate Highway 40, from east to west, and Route 491, which extends north to Shiprock. The city is a tourism center and also has industries centering on

natural gas, oil, coal, and uranium extraction. The city of Gallup’s year 2000 population was approximately 20,200 (North West New Mexico Fact Book, 2003), and about 37 percent of that number were Native American residents.

PROPOSED PROJECT AUTHORIZATION, RELATED AGREEMENTS, AND RESOLUTIONS

Reclamation

General authority to conduct water resources planning is delegated to Reclamation by Federal Reclamation Laws of 1902 and subsequent supplements. Specific authority is under P.L. 92-199 of 1971, which authorized Reclamation to conduct feasibility studies for a project to provide water to the Navajo Nation and the city of Gallup. Numerous studies were conducted in the intervening years, and a major study effort has been funded since the year 2000, with in-kind cost sharing by the Navajo Nation, the city of Gallup, and the Jicarilla Apache Nation (volume II, appendix A). These studies have resulted in this PR/FEIS, which includes appraisal-level designs and cost estimates.

The proposed project authorization was included in the recently enacted Omnibus Public Land Management Act of 2009, Title X, Part III (P.L. 111-11, March 30, 2009). The act authorizes the Secretary of the Interior (Secretary) to:

1. Construct, operate, and maintain the proposed project
2. Allocate the capacity of the proposed project among the Navajo Nation, Jicarilla Apache Nation, and the city of Gallup
3. Enter into proposed project repayment contracts with the city of Gallup and the Jicarilla Apache Nation

In general, the Secretary, acting through the Commissioner of Reclamation, is authorized to design, construct, operate, and maintain the proposed project in substantial accordance with the preferred alternative in the draft environmental impact statement.

The Omnibus Public Land Management Act of 2009 (P.L. 111-11) approved, ratified, and confirmed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (Navajo Settlement Agreement) under Title X, Part IV of the act. This PR/FEIS does not analyze the Navajo Settlement Agreement; however, the act requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010.

Water Resource Development Strategy of the Navajo Nation

The Navajo Nation's water resource strategy combines Tribal, Federal, State, and private resources and includes (Navajo Nation Department of Water Resources, 2001):

- Maintaining a water resource development task force, which will coordinate technical and fiscal resources of the Navajo Nation and Federal agencies
- Preparing a reservation-wide needs assessment and prioritizing projects
- Developing regional water supply projects
- Developing and rehabilitating local water supply and distribution systems
- Completing the Navajo Indian Irrigation Project (NIIP) and continuing to address deficiencies in water storage facilities

City of Gallup and the Navajo Nation

In 1998, the city of Gallup Mayor and the Navajo Nation President signed a Memorandum of Agreement (MOA) (attachment A) to cooperate on the planning for the proposed project. The MOA commits the city of Gallup and the Navajo Nation to:

- A cooperative effort to proceed with planning and development.
- A project that works conjunctively with the NIIP.
- A project that will result in a fair and equitable distribution of project water between the city of Gallup and Navajo Nation communities.
- A cooperative investigation of all viable alternative project configurations.
- Work together to resolve issues affecting the implementation of the proposed project.
- Support the commitment of the Bureau of Indian Affairs (BIA) to engage in section 7 (endangered species) consultation with the U.S. Fish and Wildlife Service (Service) as quickly as possible. Reclamation, as the lead Federal agency, has responsibility for section 7 consultation.

The MOA continues to serve as the basis for the collaborative efforts of the Navajo Nation and the city of Gallup to develop the proposed project. The Navajo Nation and the city of Gallup also executed a Memorandum of Understanding in October 2007 (attachment B) that addresses (1) exchange of groundwater for the Gallup Regional System and (2) a potential water supply for the city of Gallup. Resolutions of support for the proposed project from the Navajo Nation Resources Committee and local Navajo chapters are included in attachments C and D, respectively.

Upper Colorado River Commission

Recognizing the need to develop depletion schedules for long-range planning, the Upper Colorado River Commission (Commission) periodically assesses the depletion projections for the Upper Colorado Basin States. Projections by the State of New Mexico in May 2006 show the State not exceeding 642,400 acre-feet per year (AFY) through 2060 with full development of this proposed project (table I-1). The Commission passed a resolution in June 2003 supporting the proposed project and consenting to a diversion of water from the Upper Basin for use in the Lower Basin within New Mexico (attachment E). The Commission also passed a resolution in June 2006 supporting a proposed determination by the Secretary that sufficient water is reasonably likely to be available to fulfill the project water needs in New Mexico from the Navajo Reservoir water supply (attachment E). This water is in addition to existing Navajo Reservoir water supply contract water for other uses, under the allocations made to New Mexico in Articles III and XIV of the Upper Colorado River Basin Compact. The hydrologic determination prepared by Reclamation was signed by the Secretary on June 8, 2007.

State of New Mexico/Navajo Nation Negotiations

The proposed project is a component of the Navajo Settlement Agreement that was signed by the State of New Mexico and the Navajo Nation on April 19, 2005. The Navajo Settlement Agreement quantifies the Nation's water rights in the San Juan River Basin (Basin) in New Mexico. The settlement relies on congressional approval of the Navajo Settlement Agreement and Federal funding for Reclamation to construct the proposed project. The Navajo Settlement Agreement includes provisions for a long-term Navajo Reservoir water supply contract for the Nation's use under the proposed project in New Mexico. The quantification and settlement of the Navajo Nation's water rights for its uses under the project in Arizona are currently being discussed between the State of Arizona and the Nation.

The Omnibus Public Land Management Act of 2009 (P.L. 111-11) approved, ratified, and confirmed the Navajo Settlement Agreement under Title X, Part IV of the act. This PR/FEIS does not analyze the Navajo Settlement Agreement; however, the act

Table I-1.—State of New Mexico schedule of anticipated Upper Basin depletions (May 2006)¹
(1,000 AFY)

	2000	2010	2020	2030	2040	2050	2060
Irrigation uses²							
Navajo Nation Irrigation:							
Navajo Indian Irrigation Project	150.0	215.0	250.0	270.0	270.0	270.0	270.0
Fruitland-Cambridge Irrigation Project	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Hogback-Cudei Irrigation Project	15.5	15.5	21.3	21.3	21.3	21.3	21.3
Chaco River drainage irrigation	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Crystal area irrigation	0.3	0.3	0.3	0.3	0.3	0.3	0.3
<i>Navajo Nation irrigation subtotal</i>	176.9	241.9	282.7	302.7	302.7	302.7	302.7
Non-Navajo Irrigation:							
Above Navajo Dam (including Jicarilla)	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Upper San Juan (excluding Hammond)	10.3	10.3	10.3	10.3	10.3	10.3	10.3
Hammond Irrigation Project	12.1	12.1	12.1	12.1	12.1	12.1	12.1
Animas River ditches	40.7	40.7	40.7	40.7	40.7	40.7	40.7
La Plata River ditches	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Farmers Mutual Ditch	11.2	11.2	11.2	11.2	11.2	11.2	11.2
Jewett Valley Ditch	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Chaco River drainage irrigation	0.7	0.7	0.7	0.7	0.7	0.7	0.7
<i>Non-Navajo irrigation subtotal</i>	86.5	86.5	86.5	86.5	86.5	86.5	86.5
<i>Irrigation total</i>	263.4	328.4	369.2	389.2	389.2	389.2	389.2
Stockpond evaporation and stock use	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Municipal and domestic uses²							
Current M&I uses	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Animas-La Plata Project:							
San Juan Water Commission	1.0	5.0	10.4	10.4	10.4	10.4	10.4
Navajo Nation	0.0	1.0	2.0	2.3	2.3	2.3	2.3
La Plata Conservancy District	0.0	0.0	0.8	0.8	0.8	0.8	0.8
Ridges Basin Reservoir evaporation - NM share	0.0	0.0	0.1	0.1	0.1	0.1	0.1
<i>Animas-La Plata Project subtotal</i>	1.0	6.0	13.3	13.6	13.6	13.6	13.6
Navajo-Gallup Water Supply Project: ³							
Navajo Nation	0.0	0.0	7.9	10.2	12.5	12.5	12.5
Jicarilla Apache Nation	0.0	0.0	0.8	1.0	1.2	1.2	1.2
<i>Navajo-Gallup Project subtotal (within Basin)</i>	0.0	0.0	8.7	11.2	13.7	13.7	13.7
Navajo Nation municipal use, future (excluding the Navajo-Gallup Water Supply Project)	0.0	0.0	1.0	1.0	2.0	2.0	2.0
Jicarilla Apache Nation municipal use (excluding the Navajo-Gallup Water Supply Project)	0.0	0.0	0.0	0.4	0.6	0.6	0.6
Scattered rural domestic (including Jicarilla)	1.0	1.0	1.0	1.1	1.1	1.2	1.2
<i>Municipal and domestic total</i>	11.7	16.7	33.7	37.0	40.7	40.8	40.8

Table I-1.—State of New Mexico schedule of anticipated Upper Basin depletions (May 2006) – continued
(1,000 AFY)

	2000	2010	2020	2030	2040	2050	2060
Power and industrial uses							
PNM – Navajo Reservoir contract ⁴	16.2	16.2	16.2	16.2	16.2	16.2	16.2
BHP Billiton	37.0	37.0	38.0	39.0	39.0	39.0	39.0
Bloomfield Industrial	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Navajo Nation – Shiprock	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Navajo-Gallup Water Supply Project – NAPI ³	0.0	0.0	0.7	0.7	0.7	0.7	0.7
Small Navajo reservoir contracts	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<i>Power and industrial total</i>	56.1	56.1	57.8	58.8	58.8	58.8	58.8
Exports							
San Juan-Chama Project	105.2	105.2	105.2	105.2	105.2	105.2	105.2
Navajo-Gallup Water Supply Project: ³							
Navajo Nation in New Mexico	0.0	0.0	4.0	5.8	7.6	7.6	7.6
City of Gallup	0.0	0.0	4.7	6.1	7.5	7.5	7.5
<i>Navajo-Gallup Project subtotal (export)</i>	0.0	0.0	8.7	11.9	15.1	15.1	15.1
<i>Export total</i>	105.2	105.2	113.9	117.1	120.3	120.3	120.3
Reservoir evaporation							
Navajo Reservoir evaporation	28.3	28.0	27.7	27.7	27.7	27.7	27.7
Small reservoir evaporation	1.2	1.2	1.2	1.2	1.2	1.2	1.2
<i>Reservoir evaporation total</i>	29.5	29.2	28.9	28.9	28.9	28.9	28.9
Total depletions⁵							
	469.9	539.6	607.5	635.0	641.9	642.0	642.0
State share of Upper Basin yield ⁶	642.4	642.4	642.4	642.4	642.4	642.4	642.4
Remaining available ⁶	172.5	102.8	34.9	7.4	0.5	0.4	0.4
Percent of State share remaining	26.9%	16.0%	5.4%	1.2%	0.1%	0.1%	0.1%

¹ These projections were prepared by the State of New Mexico and do not necessarily represent the Jicarilla Apache Nation's or any other water user's estimate of its own depletions in 2000 or in future years.

² Does not reflect post-1965 transfers from irrigation to M&I uses.

³ Proposed Navajo-Gallup Water Supply Project depletions in New Mexico total 29,500 acre-feet per year. Exports to Gallup are anticipated to be supplied through a subcontract with the Jicarilla Apache Nation. Exports for Navajo Nation uses in Arizona are not included.

⁴ Supplied through a subcontract with the Jicarilla Apache Nation.

⁵ This is a schedule of anticipated depletions for planning purposes only. It is not a tabulation or determination of water rights or actual uses. Total depletions exclude New Mexico's share of reservoir evaporation from the major reservoirs constructed under the Colorado River Storage Project (CRSP) Act that are used principally to regulate compact deliveries at Lee Ferry and generate CRSP hydroelectric power. These include Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit.

⁶ This depletion schedule does not attempt to interpret the Colorado River Compact, the Upper Colorado River Basin Compact, or any other element of the "Law of the River." This schedule should not be construed as an acceptance of any assumption that limits the Upper Colorado River Basin's depletion or New Mexico's depletion. Of the water available to the Upper Basin at Lee Ferry, the allocation for use by New Mexico is listed in this schedule, for planning purposes, as 642,400 acre-feet. This amount does not include New Mexico's share of CRSP reservoir evaporation other than Navajo Reservoir evaporation.

requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010.

Jicarilla Apache Tribal Council Resolution(s)

Participation of the Jicarilla Apache Nation in the proposed project would provide an opportunity for them to utilize a portion (1,200 acre-feet) of their Basin water rights for on-reservation development.² The Tribal Council passed a resolution in June 2000 to participate in planning of the proposed project.

The Jicarilla Apache Nation intends to engage in substantive discussions with the Navajo Nation, the city of Gallup, and Reclamation regarding an appropriate water supply for the proposed project and options for serving a portion of the Jicarilla Apache Nation through the proposed project (attachment F). Stand-alone pipeline projects from the Navajo River or other locations to the Teepee Junction area are cost prohibitive for the Jicarilla Apache Nation. However, by participating in the proposed project, the Jicarilla Apache Nation may be able to realize its development goals with water delivered to the desired location in a relatively cost-efficient manner by partnering with the Navajo Nation and the city of Gallup.

COOPERATING AGENCIES, PUBLIC INVOLVEMENT, AND SCOPING

In addition to the public information and scoping meetings and formal coordination required by law, as discussed in chapter VII, a number of agencies and entities have been involved in planning. A project steering committee has been established and functioning since the early 1990s. The committee's purpose is to oversee and guide the planning and implementation of the proposed project. The committee is composed of representatives from the Navajo and Jicarilla Apache Nations, State of New Mexico, Northwest New Mexico Council of Governments, city of Gallup, Navajo Tribal Utility Authority, BIA, and Indian Health Service. Since 2000, the committee has met quarterly to discuss planning status, address issues, and make assignments. For the purposes of this PR/FEIS preparation, the steering committee members also serve as the cooperating agencies for implementation of NEPA.

² Jicarilla Apache water rights were specified in the 1992 Jicarilla Apache Tribe Water Rights Settlement Act (P.L. 102-441).

PREVIOUS STUDIES

Over the past 40 years, a number of 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,”³ culminated in a reconnaissance report dated October 1973. A second study⁴ was completed in January 1984 and included expanded service to Navajo communities as well as to the city of Gallup. An appraisal-level estimate⁵ for a system with a main transmission line along Highway 371 was completed in September 1986. In November 1993, an appraisal-level study⁶ was conducted to deliver water from the Gallegos Reservoir, a planned feature of the NIIP. Previous Reclamation studies have been appraisal level.

This project has evolved as a major infrastructure initiative to supply approximately 23,900 acre-feet of water per year by year 2020 and approximately 37,800 acre-feet of municipal water per year by year 2040 to meet these needs. A detailed history of the proposed project can be found in volume II, appendix A, section 3.0.

OTHER PROJECTS AND ACTIONS IN THE SAN JUAN RIVER BASIN

Regulations for implementing NEPA require Reclamation to consider the relationship of the proposed project to other projects and activities in the area. That relationship has been considered by Reclamation, and it helped to determine the appropriate scope of this PR/FEIS. The relationship can be direct, indirect, or cumulative in nature. It extends to activities that are:

- **Connected actions** (40 Code of Federal Regulations [CFR] 1508.25(a)(1)), which means they are closely related and should be discussed in the same environmental impact statement
- **Cumulative actions** (40 CFR 1508.25(a)(2)), which, when viewed with other proposed actions, have cumulatively significant impacts

³ *Gallup Project Reconnaissance Report*, U.S. Department of the Interior, Reclamation, 1973.

⁴ *Gallup-Navajo Indian Water Supply Project, Planning Report/Draft Environmental Impact Statement*, U.S. Department of the Interior, Reclamation, Southwest Region, January 1984.

⁵ *Gallup-Navajo Indian Water Supply Project, New Mexico, Arizona, Technical Report*, U.S. Department of the Interior, Reclamation, Southwest Region, September 1986.

⁶ *San Juan River Gallup/Navajo Water Supply Project, Engineering and Cost Estimates, Technical Appraisal Report*, Reclamation, November 1993.

- **Similar actions** (40 CFR 1508.25(a)(3)), which have similarities to the proposed actions that provide a basis for evaluation together, such as common timing or geography

The status of other projects in the Basin has been particularly important to this project because of a need to secure a water supply in the face of diminishing opportunities. The Upper Colorado River Compact, development of the NIIP, Endangered Species Act (ESA), San Juan River Basin Recovery Implementation Program (SJRBRIP), Indian water rights settlements, the Animas-La Plata (ALP) Project, and current development all play a role in additional water development in the Basin. These projects, primarily cumulative in terms of their impacts, are summarized in the following sections.

San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement

On April 19, 2005, the State of New Mexico and the Navajo Nation signed the Navajo Settlement Agreement (Navajo Nation – State of New Mexico, 2005). Once executed by the Secretary, the agreement will resolve the claims of the Navajo Nation to the use of waters of the Basin in New Mexico. The Navajo Settlement Agreement is intended to provide water rights and associated water development projects, including the proposed project, for the benefit of the Navajo Nation in exchange for a release of claims to water that potentially might otherwise displace existing non-Navajo water uses in the Basin in New Mexico.

The Omnibus Public Land Management Act of 2009 (Public Law 111-11) approved, ratified, and confirmed the Navajo Settlement Agreement under title X, par IV of the act. This PR/FEIS does not analyze the Navajo Settlement Agreement; however, the act requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010. Additional NEPA compliance may be needed to implement other portions of the agreement (Fruitland-Cambridge, Hogback-Cudei, conjunctive use groundwater wells, and others).

Navajo Indian Irrigation Project

The NIIP was authorized in 1962 by P.L. 87-483. This public law authorized the Secretary to construct, operate, and maintain the NIIP for the principal purpose of furnishing irrigation water to approximately 110,630 acres of land. The NIIP consists of the initial land development, water distribution system, water delivery, roads, and other infrastructure. In 1970, the Navajo Nation created NAPI to run the agricultural business venture and take responsibility for operating the NIIP facilities. The NIIP is

approximately 70 percent complete, with 77,685 acres developed. The average amount of water diverted by the NIIP from Navajo Reservoir from 2001 through 2005 was approximately 172,000 AFY. Based on an average unit depletion of 2.44 acre-feet per acre, at full build-out, with all of the proposed project acreage irrigated, the NIIP will divert approximately 337,500 acre-feet and deplete approximately 270,000 AFY of San Juan River water. This diversion amount includes significant conservation measures and alternatives as described in the NIIP biological assessment and biological opinion.

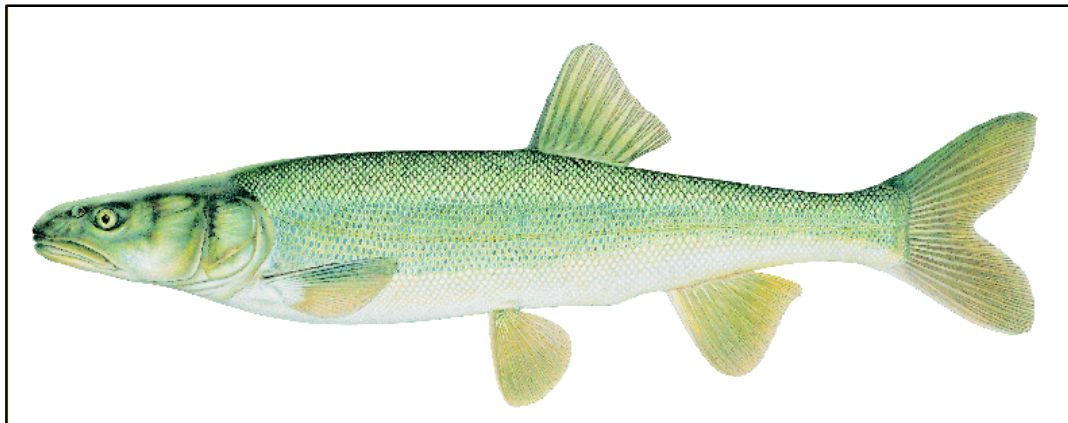
San Juan River Basin Recovery Implementation Program

Federal and State agencies, water users, and Indian Tribes have been cooperating in the SJRBRIP. Established in 1992, the SJRBRIP is composed of a partnership among the Jicarilla Apache Nation, Navajo Nation, Southern Ute Indian and Ute Mountain Ute Tribes, States of Colorado and New Mexico, BIA, Bureau of Land Management, Reclamation, the Service, and water development interests. The goal of the SJRBRIP is twofold:

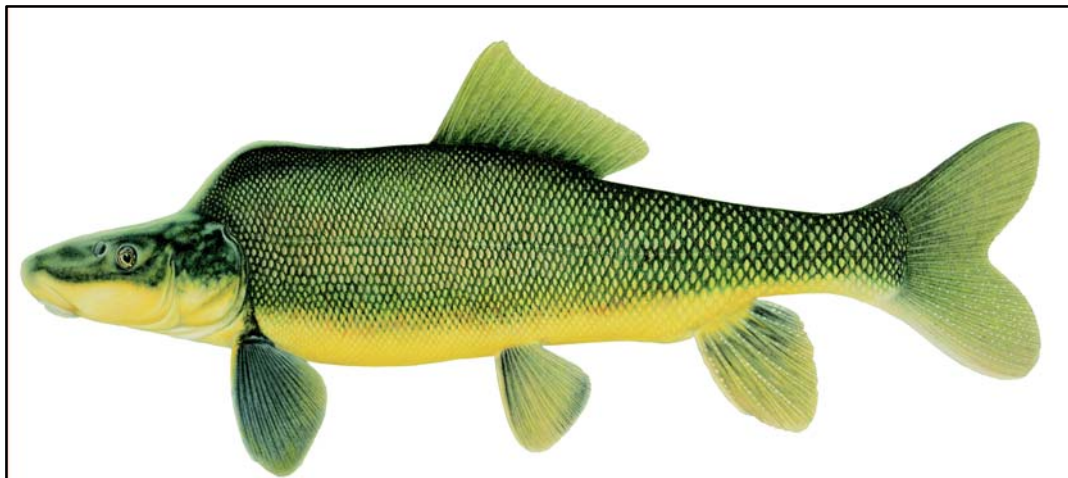
- (1) To conserve populations of Colorado pikeminnow and razorback sucker (figure I-2) in the Basin, consistent with the recovery goals established under the ESA, 16 United States Code (U.S.C.) 1531 et seq.
- (2) To proceed with water development in the Basin in compliance with Federal and State laws, interstate compacts, Supreme Court decrees, and Federal trust responsibilities to the Southern Ute Indian Tribe, Ute Mountain Ute Tribe, Jicarilla Apache Nation, and Navajo Nation

Program elements include the following:

- (1) *Protection, Management, and Augmentation of Habitat* – This element identifies important river reaches and habitats for different life stages of the endangered fishes and makes appropriate habitat improvements, including providing flows in the San Juan River and passage around migration barriers so as to provide suitable habitat to support recovered fish populations.
- (2) *Water Quality Protection and Enhancement* – This element identifies and monitors water quality conditions and takes actions to diminish or eliminate identified water quality problems that limit recovery.
- (3) *Interactions Between Native and Non-Native Fish Species* – This element identifies problematic non-native fish species and implements actions to reduce negative interactions between the endangered fish and non-native fish species.



Colorado pikeminnow



Razorback sucker

Figure I-2.— Colorado pikeminnow and razorback sucker.
(Illustrations copywritten by Joseph R. Tomelleri)

- (4) *Monitoring and Data Management* – This element evaluates the status and trends of endangered fish species, as well as other native and non-native species, and measures progress toward achieving recovery goals.
- (5) *Protection of Genetic Integrity and Management and Augmentation of Populations* – This element ensures that the SJRBRIP’s augmentation protocols maintain genetically diverse fish species while raising new generations of Colorado pikeminnow and razorback sucker to stock in the river system.

A 7-year research program was completed by the SJRBRIP, and Flow Recommendations were approved by the SJRBRIP in 1999. These Flow Recommendations have been implemented through reoperation of Navajo Reservoir. Fish passage has been restored at the Public Service Company of New Mexico, Hogback, and Cudei diversions on the San Juan River.

In 2001, the SJRBRIP adopted principles for section 7 consultation in the San Juan River Basin (attachment O). The principles are used as a guide to define how the SJRBRIP can be used to provide ESA compliance for impacts to listed fish species in the Basin for water development and water management activities. Colorado River Storage Project power revenues have been used to fund a significant portion (in excess of \$16 million) of the SJRBRIP.

Animas-La Plata Project

The ALP Project, located in southwestern Colorado and northwestern New Mexico, is being implemented as a component of the overall settlement of the Colorado Ute Tribal water rights. The ALP Project will provide an M&I water supply to the entities listed below (including their respective average annual allocated water depletion).

Entity	Average annual depletion (AFY)
Southern Ute Indian Tribe	16,525
Ute Mountain Ute Tribe	16,525
Navajo Nation	2,340
San Juan Water Commission	10,400
Animas-La Plata Water Conservancy District	2,600
State of Colorado	5,230
La Plata Conservancy District, New Mexico	780

As of October 1, 2008, construction was approximately 64 percent complete on the ALP Project, and it is anticipated to be completed in 2012. However, the project schedule is highly dependent upon future appropriations. Implementation of the SJRBRIP is the key element of the reasonable and prudent alternative⁷ (RPA) for section 7 consultation under the ESA that would permit completion of the ALP Project.

Navajo Reservoir Operations (Navajo Unit of the Colorado River Storage Project)

Reclamation, in April 2006, completed the Navajo Reservoir Operations Final Environmental Impact Statement (FEIS), and the Navajo Reservoir FEIS Record of Decision (ROD) was signed in July 2006. In accordance with the ROD, the reservoir will be operated in the future so that releases from Navajo Dam will generally range between 250 and 5,000 cubic feet per second (cfs) (the FEIS 250/5000 Alternative). For further details on this and other related projects, see the “Cumulative Impacts, Operation of Navajo Dam” section of chapter V).

As described in the Navajo Reservoir FEIS, Reclamation intends to operate Navajo Dam and Reservoir to implement ESA-related Flow Recommendations (SJRBRIP) to assist in conserving endangered fish in the San Juan River downstream from Farmington. In addition, reoperation will enable Basin water development, including this project, to proceed under applicable laws, compacts, and court decrees. An adaptive management component is also included, which allows for modification of operations based on Flow Recommendation implementation results and endangered fish responses.

Navajo Reservoir operations also constitute a connected action to other water resource activities in the Basin, such as the ALP Project and the NIIP. This connection stems from (1) past ESA consultations that relied on the SJRBRIP and listed certain RPAs to avoid jeopardy to the endangered species in question, (2) Flow Recommendations developed and approved by the SJRBRIP, and (3) Reclamation’s previous commitment to operate Navajo Reservoir for the benefit of endangered fish in the Basin.

San Juan-Chama Project

Reclamation’s San Juan-Chama Project diverted an annual average of 90,800 acre-feet of water from the Basin and transported the water across the Continental Divide for use in the Rio Grande Basin in New Mexico between 1972 and 2004. The long-term average

⁷ Regulations implementing the ESA, section 7, define reasonable and prudent alternatives as alternative actions that avoid a jeopardy determination for the endangered species identified during formal consultation with the Service.

San Juan-Chama Project diversion is anticipated to be about 105,200 AFY, as shown in Table I-1, State of New Mexico schedule of anticipated Upper Basin depletions. This reflects full project demands in the future under the full range of historic flow availability for the period of record. The Jicarilla Apache Nation has rights to divert and deplete 6,500 acre-feet of San Juan-Chama Project water annually, an amount that is included in the environmental baseline for the Basin. Under San Juan Chama Project authorizing legislation, diversions in New Mexico should not limit current or future beneficial uses in Colorado.

Other Related Actions

- Actions to implement some or all of the Jicarilla Apache Tribe Water Rights Settlement Act (Jicarilla Settlement Act) (P.L. 102-441) and related water service contracts
- Actions to develop some of the water rights established in the 1986 Colorado Ute Indian Water Rights Settlement Agreement and the Colorado Ute Settlement Act, amendments of 2000
- The exercise of other, presently unquantified Indian or Federal water rights
- Unspecified future non-Indian water development

WATER RIGHTS BACKGROUND

Indian Water Rights

Indian Tribes in and near the proposed project area may have reserved water rights to provide sufficient water to serve the purposes of their reservations. Such reserved rights may date from the time treaties, statutes, and Executive orders established reservations of land for the Tribe and are typically senior to other rights in the Basin. In certain instances, rights have been subordinated to later priority dates by agreement. For example, Indian water uses from Navajo Reservoir and from the ALP Project will be administered with the same priority as non-Indian water uses from these projects in accordance with Federal legislation and water rights settlements. In the Basin, combined Indian water rights constitute a potential right to much of the available water. The major treaties and other settlements implicating Indian water rights in the Basin are:

- (1) Northwestern New Mexico Rural Water Projects Act (title X, subtitle B of the Omnibus Public Land Management Act of 2009, P.L. 111-11, March 30, 2009) (attachment P)
- (2) Jicarilla Settlement Act (P.L. 102-441) of 1992 and the contract between the United States and the Jicarilla Apache Tribe, December 8, 1992
- (3) Treaty between the United States of America and the Navajo Tribe of Indians of 1849 (ratified by the Senate on September 9, 1850; proclaimed by the President on September 24, 1850; 9 Stat. 974), and the treaty between the United States of America and the Navajo Tribe of Indians (concluded June 1, 1868; ratification advised July 25, 1868; proclaimed August 12, 1868; 15 Stat. 667)
- (4) Colorado Ute Indian Water Rights Settlement Act of 1988 (P.L. 100-585) and Colorado Ute Indian Settlement Act Amendments of 2000 (P.L. 106-554), as amended

Non-Indian Water Rights

Water rights in the Basin are administered by the States of Arizona, Colorado, New Mexico, and Utah according to State water law and to the interstate compacts that divide the use of the waters of the Colorado River and its tributaries among the Colorado River Basin States. Some of the interstate compacts affecting the distribution of the water in the Basin are briefly summarized below:

- (1) *Colorado River Compact*⁸ – Divides the Colorado River Basin at Lee Ferry, Arizona, into the Upper and Lower Basins, apportions to the Upper Basin the right to the beneficial consumptive use of 7.5 million acre-feet (MAF) per annum, and requires the States of the Upper Basin to not cause the flow at Lee Ferry to be depleted below a total of 75 MAF for any period of 10 consecutive years.
- (2) *Upper Colorado River Basin Compact* – Subject to the provisions and limitations contained in the Colorado River Compact, the Upper Colorado River Basin Compact, among other things, divides consumptive use, apportions to, and makes available for use each year by the Upper Basin States, amounts as follows:

⁸ It should be noted that the Navajo Nation interprets that the allocations in the 1922 Colorado River Compact and the 1948 Upper Colorado River Basin Compact do not limit the Navajo Nation's claim to water within the Colorado River system. Not all States agree with this interpretation.

- Arizona – 50,000 acre-feet per annum, and

The amount remaining after deduction of use made in Arizona:

- Colorado – 51.75 percent
- New Mexico – 11.25 percent
- Utah – 23 percent
- Wyoming – 14 percent

The Upper Colorado River Basin Compact (Article XIV) apportions the water of the San Juan River and its tributaries in Colorado and New Mexico between the States of Colorado and New Mexico. In short, within the limitations described in Article XIV, the State of Colorado agrees to deliver to New Mexico from the San Juan River and its tributaries water sufficient to enable New Mexico to make full use of its compact apportionment subject to satisfaction first of water uses made at the time the compact was signed and water uses contemplated by water projects authorized at the time the compact was signed.

- (3) *La Plata River Compact* – This compact divides the waters of the La Plata River between the States of Colorado and New Mexico. In summary, each day during the period February 16 through November 30 of each year, Colorado is to deliver to New Mexico 100 cfs, or an amount equivalent to one-half of the mean daily flow at the Hesperus Station, for the preceding day, or the amount of water then needed for beneficial use in the State of New Mexico, whichever is less.
- (4) *Animas-La Plata Compact* – This compact states that the water rights to store and divert water in Colorado for ALP uses in New Mexico shall be of equal priority with those rights granted by the Colorado State courts for ALP Project water uses in Colorado.

RESPONSIBILITIES AND COMPLIANCE

Environmental

Clean Air Act (42 U.S.C. 7401 et seq.)

Clean Water Act of 1972 (33 U.S.C. 1251 et seq.)

Endangered Species Act of 1973 (16 U.S.C. 1532 et seq.)

Fish and Wildlife Coordination Act (48 Stat., as amended; 16 U.S.C. 661)

National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)

Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1532 et seq.)
Executive Order 11988, Floodplain Management, 1977
Executive Order 11990, Protection of Wetlands, 1977
Executive Order 11991, Protection and Enhancement of Environmental Quality, 1977

Cultural Preservation

Archaeological and Historic Preservation Act (16 U.S.C. 469 et seq.)
Archaeological Resources Protection Act of 1979 (16 U.S.C. 470 et seq.)
Historic Sites, Buildings, and Antiquities Act (16 U.S.C. 461 et seq.)
National Historic Preservation Act (16 U.S.C. 470 et seq.)
Executive Order 11593, Protection and Enhancement of the Cultural Environment, 1971

American Indian

American Indian Religious Freedom Act of 1978, as amended (42 U.S.C. 1996)
Native American Graves Protection and Repatriation Act of 1990
(25 U.S.C. 3001 et seq.)
Religious Freedom Restoration Act of 1993 (P.L. 13-141)
Executive Order 13007 (Indian Sacred Sites)
Secretarial Orders 13175 and 3206 on Indian Trust Assets
General Allotment Act of 1877 (24 Stat. 388, chapter 119, 25 USCA 331)

Other

Executive Order 12898, Environmental Justice in Minority Populations and Low
Income Populations, 1994
Reclamation Reform Act of 1982 (P.L. 97-293, Title II, 96 Stat. 1263)
Applicable State and Tribal laws implementing the Federal laws identified above

DOCUMENT REVIEW

Reclamation's Notice of Intent to prepare the planning report/draft environmental impact statement (PR/DEIS) was published in the *Federal Register* on March 27, 2000. Scoping meetings were held in five locations on the following dates:

Location	Dates (during 2000)
Crownpoint, New Mexico	April 25
Saint Michaels, Arizona	April 26
Gallup, New Mexico	April 27
Shiprock, New Mexico	May 2
Farmington, New Mexico	May 3

The written responses were reviewed by Reclamation and incorporated in the PR/DEIS when they were within the scope of the Federal action. The PR/DEIS was reviewed by cooperating agencies. The PR/DEIS Notice of Availability for a 90-day public review and comment period was published in the *Federal Register* on March 30, 2007, which included an announcement of public hearings. The 90-day comment period was from March 30, 2007, to June 28, 2007. Public hearings were held at five locations on the following dates:

Location	Dates (during 2007)
Gallup, New Mexico	May 22
Crownpoint, New Mexico	May 23
Saint Michaels, Arizona	May 24
Shiprock, New Mexico	June 5
Farmington, New Mexico	June 6

During the public review and comment period, oral testimony and written comments were received. Written responses to comments are published as volume III of this PR/FEIS.

In November 2007, several sections of the PR/DEIS were updated in a report entitled, *Cost and Economic Update to 2007 Prices of the Planning Report and Draft Environmental Impact Statement*. All entities on the mailing list were either sent copies of the cost and economic update report or post cards notifying them of the report's availability. The updated cost and economic information is included in this PR/FEIS. Responses to substantive comments will be incorporated in the ROD, which concludes the NEPA process.

Copies of this document and volume II (appendices) are available at Reclamation's Western Colorado Area Offices in Durango and Grand Junction, Colorado; the Upper Colorado Regional Office, Salt Lake City, Utah; Technical Service Center, Denver, Colorado; and at area public libraries. The PR/FEIS is also available at <http://www.usbr.gov/uc> (select "Environmental Documents"). The PR/DEIS and PR/FEIS were mailed to individuals and parties listed on Reclamation's environmental impact statement distribution list (see chapter VII).

DOCUMENT ORGANIZATION

This PR/FEIS includes three volumes. This document is volume I, the technical appendices constitute volume II, and volume III contains written and public hearing comments with agency responses.

Volume I includes:

- **Executive Summary**
- **Chapter I – Introduction**, discusses the general purpose of the proposed project; its location, background, and authorization; and such topics as project coordination, previous studies, related actions, and compliance.
- **Chapter II – Need for Action**, describes the problems this PR/FEIS addresses.
- **Chapter III – Opportunities/Resources and Constraints**, cites resources available to complete the proposed project as well as institutional, technical, and other barriers to its implementation.
- **Chapter IV – Alternatives**, describes earlier planning for the proposed project, standards for plans, various screening/selection criteria, the concept of four-account analysis, and plan selection.
- **Chapter V – Affected Environment and Environmental Consequences**, describes the affected environment and the potential impacts of the alternatives (compared to the No Action Alternative) on each of the environmental parameters. Proposed mitigation measures, if any, are included. Indirect effects and cumulative, connected, and similar actions are also described.
- **Chapter VI – Environmental Commitments and Mitigation Measures**, describes potential environmental commitments associated with implementing the preferred alternative.

- **Chapter VII – Consultation and Coordination**, summarizes the public involvement/scoping process and agency coordination.
- **Chapter VIII – Permits, Approvals, and Regulatory Requirements**, discusses the permits, approvals, and regulatory requirements necessary for the construction, operation, and maintenance of the preferred alternative.
- **Attachments A – P**
 - A** Memorandum of Agreement between the city of Gallup and the Navajo Nation to Cooperate on the Navajo-Gallup Water Supply Project (IGRF-33-98)
 - B** Memorandum of Understanding between the Navajo Nation and the City of Gallup Concerning Water Supplies for the Navajo-Gallup Water Supply Project (October 2007)
 - C** Resolution of the Resources Committee of the Navajo Nation Council
 - D** Resolutions of the Navajo Nation Chapters
 - E** Resolutions of the Upper Colorado River Commission
 - F** Letter from Jicarilla Apache Tribe to the Bureau of Reclamation (February 16, 2001)
 - G** Letter from Honorable Kelsey A. Begaye, President of the Navajo Nation, and Honorable John Peña, Mayor of the city of Gallup, to Eluid Martinez, Commissioner of the Bureau of Reclamation (November 22, 2000)
 - H** Letters from Eluid L. Martinez, Commissioner of the Bureau of Reclamation (December 26, 2000), and Rick L. Gold, Regional Director, Upper Colorado Regional Office, to Honorable Kelsey A. Begaye, President of the Navajo Nation, and Honorable John Peña, Mayor of the city of Gallup (June 13, 2001)
 - I** Preferred Alternative
 - J** Screening Report
 - K** Vegetation
 - L** List of Wildlife Found in the Project Area and Habitat Associations

- M** Soil and Geology Descriptions
- N** Hydrologic Determination, 2007, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico
- O** Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin
- P** Northwestern New Mexico Rural Water Projects Act (Public Law 111-11, title X, subtitle B)

Volume II includes appendices A – D

- A** Technical Memorandum (Final Draft – March 16, 2001)
- B** Appraisal Level Designs and Cost Estimates (April 2002)
- C** *Part I* Fish and Wildlife Service Memorandum (December 3, 2002)
Planning Aid Memorandum for the Navajo-Gallup Water Supply Project Environmental Impact Statement (EIS), New Mexico
- Part II* Fish and Wildlife Service Memorandum (March 16, 2009)
Draft Fish and Wildlife Coordination Act Report for the Navajo-Gallup Water Supply Project, New Mexico and Arizona
- Part III* Final Biological Opinion (February 26, 2009)
- D** *Part I* Allocation of Capital and OM&R Costs Among Project Participants (San Juan River - PNM Alternative)
- Part II* Economic Benefit/Cost Analysis
- Part III* Financial and Repayment Analysis
- Part IV* Social Impacts from the Navajo-Gallup Water Supply Project

Volume III includes:

- Comments and Responses



Chapter II

NEED FOR ACTION

Introduction

Navajo Nation and Gallup, New Mexico – Problem Identification

Navajo Nation and Gallup, New Mexico – Problem Quantification

Jicarilla Apache Nation – Problem Identification

Jicarilla Apache Nation – Problem Quantification

INTRODUCTION

This chapter describes and quantifies water demand and supply problems for the Navajo Nation, city of Gallup, and Jicarilla Apache Nation. In the view of the Navajo Nation, a poverty rate of greater than 50 percent and a growing population combined with a lack of infrastructure, particularly for water, on a vast, arid reservation with widely dispersed communities and households has created an urgent need for adequate water supplies. The lack of infrastructure and economic development and sustained poverty are closely connected, and they are related to a reliable water supply. The city of Gallup's position is that groundwater is being depleted faster than it is being recharged, and the quality does not meet secondary water quality standards. Severe water shortages are anticipated within the next *decade*. The Jicarilla Apache Nation asserts that it needs a reliable, high-quality water supply in areas outside Dulce to continue diversifying their economy for on-reservation employment and to live in a more dispersed manner as they did traditionally and have stated it desires to do so in the future.

The general study area, east of the Chuska Mountains, is primarily semiarid and desert-like in nature, with low rainfall and low carrying capacity for most forms of wildlife. The vegetative diversity is low, and ground cover in many areas is sparse, offering very little habitat for most forms of wildlife. Land use is primarily open range and sparsely populated, except for those scattered communities along Route 491, and generally undeveloped.

The San Juan River Valley in the northern part of the Navajo-Gallup Water Supply Project (proposed project) area is an oasis in what is otherwise a dry and almost barren environment. The river valley supports irrigated agriculture, recreation, fish and wildlife, wetlands, riparian vegetation and habitat, and other systems that are dependent on water.

The projected Navajo Nation's population increase in the proposed project area by the year 2040 from the current 90,000 (2000 census) to 180,462 people will have an impact on the area.

The need for water, which is currently limited in quantity and quality, will continue to increase. Changes in land use patterns may occur as the population expands. The existing communities will likely expand, and new communities may be developed with adequate water supplies. Mineral and energy resource development are expected to grow, and new industries are likely to move in to use the area's human capital and natural resources and to provide services.

NAVAJO NATION AND GALLUP, NEW MEXICO – PROBLEM IDENTIFICATION

Navajo Nation

More than 40 percent of Navajo households rely on water hauling to meet daily water needs. Those households with piped water have limited water quantity and pay among the highest water rates in the region. As challenging as the current circumstances are, limited water supplies in the future will pose an even greater challenge. The Navajo Nation's predicted annual population growth rate is 2.48 percent to the year 2040.

The limited availability of water is part of the larger pattern of a low economic standard of living throughout the proposed project area. The poverty rate of greater than 50 percent on the Navajo Reservation is one of the worst in the United States, and it persists even while the regional economy is booming. The lack of infrastructure and economic development and sustained poverty are closely connected, and they are related to a reliable water supply (Navajo Nation Department of Water Resources [NNDWR], 2001).

City of Gallup

As a regional trade center, the city of Gallup supports a municipal population of about 23,000, but also serves as an economic hub for a trade area of about 100,000 people. The city relies solely on a groundwater supply that continues to be progressively mined with little recharge into the source aquifers. Current hydrologic projections by the city predict severe shortages in the groundwater supply within the next decade, which would have severe social and economic impacts on the city and on the neighboring Navajo communities (Gallup Town Hall on Water, May 2003). The city of Gallup has investigated other potential water supplies, water conservation, additional

groundwater supplies, and surface supplies. Water conservation and mining groundwater can help in the short term, but for a long-term sustainable supply, water from the San Juan River is the only viable option.

NAVAJO NATION AND GALLUP, NEW MEXICO – PROBLEM QUANTIFICATION

Population Projections

The proposed project service area includes approximately 84,000 people in New Mexico, including the city of Gallup, and approximately 15,000 people in Arizona. Population statistics are based on 1990 census data projections for the year 2000 (Rodgers, 1993). These numbers do not reflect the estimated 14 percent undercount typical for the Navajo Reservation. The 2000 census data were not available when the projections were developed in 1993; the data have since been reviewed, and the results would not be measurably different. Additional material on population growth rates and water demand is included in volume II, appendix A. Tables II-1 through II-5 illustrate population growth and the need for additional water supplies in the proposed project area.

Table II-1.—Projected population in the proposed project service area by basin

Decade	New Mexico Upper Colorado Basin	New Mexico Lower Colorado Basin	New Mexico Rio Grande Basin	Arizona Lower Colorado Basin	Project total
2000 ¹	43,453	37,828	2,504	15,033	98,818
2010	55,516	46,494	3,199	19,206	124,415
2020	70,926	57,205	4,087	24,538	156,756
2030	90,614	70,454	5,222	31,349	197,639
2040	115,767	86,861	6,672	40,052	249,352

Note: Annual growth for the city of Gallup is 1.82 percent and 2.48 percent for the Navajo Nation.

¹ Data are based on 1990 census data projections for the year 2000.

Water Resource

The water demand in the proposed project service area is based on three distinct components: current population, per capita water use, and projected growth rates, as shown in tables II-2 through II-6 and in volume II, appendix A. The city of Gallup uses 160 gallons per capita per day (gpcd) for current and future demand projections.

Table II-2.—Municipal water demand by basin for the proposed project (2020)

Municipal subarea	Basin of use ¹	1990 census pop.	2020 pop. ²	2020 demand ³ (AFY) ⁴	2020 ground-water production and ALP ⁵ (AFY)	2020 San Juan River diversion ⁶ (AFY)	2020 San Juan River depletion ⁷ (AFY)
Central Area, NM	U.C.	1,493	3,113	558	52	506	506
City of Gallup, NM ⁸	L.C.	19,154	32,904	5,898	0	7,500	7,500
Crownpoint, NM	U.C.	5,287	11,025	1,976	541	1,435	1,435
Gallup area, NM	L.C.	7,904	16,482	2,954	382	2,572	2,572
Huerfano, NM	U.C.	1,492	3,111	558	68	489	489
Navajo Agricultural Products Industry, NM ⁹	U.C.	N/A	N/A	7,274	N/A	500	500
Rock Springs, NM	L.C.	3,749	7,818	1,401	113	1,288	1,288
Route 491, NM	U.C.	10,099	21,060	3,775	635	3,139	3,139
San Juan River, NM ¹⁰	U.C.	13,804	28,786	5,159	4,680	479	240
Torreon, NM ¹¹	U.C./R.G.	3,797	7,918	1,419	95	1,324	1,324
New Mexico Upper Colorado Basin	U.C.	34,012	75,013	20,719	6,071	7,874	7,634
New Mexico Rio Grande Basin	R.G.	1,960	4,087	773	95	638	638
New Mexico Lower Colorado Basin	L.C.	30,807	57,205	10,253	496	11,360	11,360
Total New Mexico		66,779	132,218	30,972	6,567	19,234	18,994
Total Arizona¹²	L.C.	11,767	24,538	4,398	905	3,493	3,496
Project total		78,546	156,756	35,370	¹³ 7,472	22,727	22,490

Note: Rounding error may cause subtotals to be off by 1.

¹ U.C. = Upper Colorado Basin, L.C. = Lower Colorado Basin, and R.G. = Rio Grande Basin.

² Annual growth for the city of Gallup is 1.82 percent and 2.48 percent for the Navajo Nation.

³ Per capita water demand is 160 gallons per person per day.

⁴ Acre-feet per year.

⁵ ALP = Animas-La Plata; estimated sustainable groundwater production estimated by NNDWR.

⁶ Diversions = demand - groundwater use.

⁷ Depletions are based on zero return flow and use of sustainable groundwater.

⁸ The city of Gallup plans to recharge its aquifer and use groundwater for summer seasonal peaking.

⁹ Navajo Agricultural Products Industry depletions are 700 AFY, including 400 AFY for the proposed french fry factory (from March 16, 2001, NNDWR technical memorandum).

¹⁰ Approximately 4,680 AFY of diversion and 2,340 AFY of depletion from the San Juan River subarea's demand is met by the ALP Project, and 1,871 acre-feet of depletion is met by the Navajo-Gallup Water Supply Project. Assumes 50 percent of the San Juan River municipal diversions return to the river.

¹¹ Torreon includes use in the Rio Grande Basin. These depletions are counted toward New Mexico Upper Colorado River allocation.

¹² Window Rock subarea includes depletions, which are counted toward the Upper and/or Lower Colorado allocation.

¹³ Water not supplied by the Navajo-Gallup Water Supply Project.

Table II-3.—Municipal water demand by basin for the proposed project (2040)

Municipal subarea	Basin of use ¹	1990 census pop.	2040 pop. ²	2040 demand ³ (AFY) ⁴	2040 ground-water production and ALP ⁵ (AFY)	2040 San Juan River diversion ⁶ (AFY)	2040 San Juan River depletion ⁷ (AFY)
Central Area, NM	U.C.	1,493	5,082	911	77	834	834
City of Gallup, NM ⁸	L.C.	19,154	47,197	8,459	1,439	7,500	7,500
Crownpoint, NM	U.C.	5,287	17,996	3,225	752	2,473	2,473
Gallup area, NM	L.C.	7,904	26,903	4,822	506	4,316	4,316
Huerfano, NM	U.C.	1,492	5,078	910	46	864	864
Navajo Agricultural Products Industry, NM ⁹	U.C.	N/A	N/A	7,274	N/A	700	700
Rock Springs, NM	L.C.	3,749	12,761	2,287	169	2,118	2,118
Route 491, NM	U.C.	10,099	34,374	6,161	795	5,366	5,366
San Juan River, NM ¹⁰	U.C.	13,804	46,985	8,421	4,680	3,741	1,871
Torreon, NM ¹¹	U.C./R.G.	3,797	12,924	2,316	77	2,240	2,240
New Mexico Upper Colorado Basin	U.C.	34,012	115,767	28,023	7,050	15,100	13,229
New Mexico Rio Grande Basin	R.G.	1,960	6,672	1,196	77	1,119	1,119
New Mexico Lower Colorado Basin	L.C.	30,807	86,861	15,568	2,114	13,934	13,934
Total New Mexico		66,779	209,300	44,788	9,241	30,153	28,282
Total Arizona¹²	L.C.	11,767	40,052	7,179	767	6,411	6,411
Project total		78,546	249,352	51,967	¹³ 10,008	36,564	34,693

Note: Rounding error may cause subtotals to be off by 1.

¹ U.C. = Upper Colorado Basin, L.C. = Lower Colorado Basin, and R.G. = Rio Grande Basin.

² Annual growth for the city of Gallup is 1.82 percent and 2.48 percent for the Navajo Nation.

³ Per capita water demand is 160 gallons per person per day.

⁴ Acre-feet per year.

⁵ ALP = Animas-La Plata; estimated sustainable groundwater production estimated by NNDWR.

⁶ Diversions = demand - groundwater use.

⁷ Depletions are based on zero return flow and use of sustainable groundwater.

⁸ The city of Gallup plans to recharge its aquifer and use groundwater for summer seasonal peaking.

⁹ Navajo Agricultural Products Industry depletions are 700 AFY, including 400 AFY for the proposed french fry factory (from March 16, 2001, NNDWR technical memorandum).

¹⁰ Approximately 4,680 AFY of diversion and 2,340 AFY of depletion from the San Juan River subarea's demand is met by the ALP Project, and 1,871 acre-feet of depletion is met by the Navajo-Gallup Water Supply Project. Assumes 50 percent of the San Juan River municipal diversions return to the river.

¹¹ Torreon includes use in the Rio Grande Basin. These depletions are counted toward New Mexico Upper Colorado River allocation.

¹² Window Rock subarea includes depletions, which are counted toward the Upper and/or Lower Colorado allocation.

¹³ Water not supplied by the Navajo-Gallup Water Supply Project.

Table II-4.—Chapter water demand for the proposed project (2020)

Service area	Chapter	1990 population	2020 population	2020 demand (AFY) ¹	2020 ground-water production and ALP ² (AFY)	2020 San Juan River depletion ³ (AFY)
City of Gallup, NM	City of Gallup	19,154	32,904	5,898	0	7,500
Central Area, NM	Burnham	246	513	92	0	92
	Lake Valley	436	909	163	34	129
	White Rock	201	419	75	See Lake Valley	75
	Whitehorse Lake	610	1,272	228	18	210
	Subtotal	1,493	3,113	558	52	506
Crownpoint, NM		193	402	72	See Crownpoint	72
	Becenti					
	Coyote Canyon	1,234	2,573	461	47	414
	Crownpoint	2,658	5,543	993	438	555
	Dalton Pass	313	653	117	0	117
	Little Water	638	1,330	238	See Crownpoint	238
	Standing Rock	251	523	94	55	38
Subtotal	5,287	11,025	1,976	541	1,435	
Gallup area, NM	Bread Springs	1,219	2,542	456	60	396
		1,555	3,243	581	See Bread Springs	581
	Chichiltah					
	Church Rock	1,780	3,712	665	90	575
	Iyanbito	974	2,031	364	77	287
	Mariano Lake	726	1,514	271	107	164
	Pinedale	609	1,270	228	See Mariano Lake	228
	Red Rock	1,041	2,171	389	48	341
Subtotal	7,904	16,482	2,954	382	2,572	
Huerfano, NM	Huerfano	511	1,066	191	45	146
	Nageezi	981	2,046	367	23	343
	Subtotal	1,492	3,111	558	68	489
Rock Springs, NM	Manuelito	631	1,316	236	23	213
	Rock Springs	1,685	3,514	630	58	571
	Tsayatoh	1,433	2,988	536	32	504
	Subtotal	3,749	7,818	1,401	113	1,288

Table II-4.—Chapter water demand for the proposed project (2020) (continued)

Service area	Chapter	1990 population	2020 population	2020 demand (AFY) ¹	2020 ground-	2020
					water production and ALP ² (AFY)	San Juan River depletion ³ (AFY)
Route 491, NM	Mexican Springs	711	1,483	266	See Tohatchi	266
	Naschitti	1,539	3,209	575	79	496
	Newcomb	651	1,358	243	12	231
	Sanostee	2,081	4,340	778	121	657
	Sheep Springs	660	1,376	247	14	233
	Tohatchi	1,607	3,351	601	222	378
	Twin Lakes	1,967	4,102	735	120	615
	Two Grey Hills	883	1,841	330	66	264
	Subtotal	10,099	21,060	3,775	635	3,139
Torreon, NM	Counselor	1,365	2,846	510	0	510
	Ojo Encino	596	1,243	223	18	205
	Pueblo Pintado	472	984	176	0	176
	Torreon	1,364	2,844	510	77	433
	Subtotal	3,797	7,918	1,419	95	1,324
San Juan River, NM ⁴	Beclaibito	388	809	145	0	73
	Cudei	495	1,032	185	0	93
	Hogback	740	1,543	277	0	138
	Nenahnezad	1,253	2,613	468	0	234
	San Juan	540	1,126	202	0	101
	Shiprock	8,100	16,891	3,027	0	1,514
	Upper Fruitland	2,288	4,771	855	0	428
	Subtotal	13,804	28,786	5,159	4,680	240
Navajo Agricultural Products Industry, NM		N/A	N/A	7,247	N/A	500
NM Upper Basin		35,972	75,013	20,719	6,071	7,634
NM Lower Basin		30,807	57,205	10,253	496	11,360
Total New Mexico		66,779	132,218	30,972	6,567	18,994
Window Rock, AZ	Fort Defiance	6,187	12,902	2,312	905	1,408
	Saint Michaels	5,580	11,636	2,086	See Fort Defiance	2,086
Total Arizona		11,767	24,538	4,398	905	3,493
Project total		78,546	156,756	35,370	⁵ 7,472	22,487

¹ Acre-feet per year.² Animas-La Plata Project.³ Depletions assume zero return flows to the San Juan River.⁴ San Juan River depletions do not include Animas-La Plata Project water.⁵ Water not supplied by the Navajo-Gallup Water Supply Project.

Table II-5.—Chapter water demand for the proposed project (2040)

Service area	Chapter	1990 population	2040 population	2040 demand (AFY) ¹	2040 ground-water production and ALP ² (AFY)	2040 San Juan River depletion ³ (AFY)
City of Gallup, NM	City of Gallup	19,154	47,179	8,459	1,439	7,500
Central Area, NM	Burnham	246	837	150	0	150
	Lake Valley	436	1,484	266	46	220
	White Rock	201	684	123	See Lake Valley	123
	Whitehorse Lake	610	2,076	372	31	341
	Subtotal	1,493	5,082	911	77	834
Crownpoint, NM		193	657	118	See Crownpoint	118
	Becenti					
	Coyote Canyon	1,234	4,200	753	61	692
	Crownpoint	2,658	9,047	1,622	614	1,008
	Dalton Pass	313	1,065	191	0	191
	Little Water	638	2,172	389	See Crownpoint	389
	Standing Rock	251	854	153	77	76
Subtotal	5,287	17,996	3,225	752	2,473	
Gallup area, NM	Bread Springs	1,219	4,149	744	77	667
	Chichiltah	1,555	5,293	949	See Bread Springs	949
	Church Rock	1,780	6,059	1,086	123	963
	Iyanbito	974	3,315	594	153	441
	Mariano Lake	726	2,471	443	92	351
	Pinedale	609	2,073	372	See Mariano Lake	372
	Red Rock	1,041	3,543	635	61	574
	Subtotal	7,904	26,903	4,822	506	4,316
Huerfano, NM	Huerfano	511	1,739	312	31	281
	Nageezi	981	3,339	598	15	583
	Subtotal	1,492	5,078	910	46	864
Rock Springs, NM	Manuelito	631	2,148	385	46	339
	Rock Springs	1,685	5,735	1,028	77	951
	Tsayatoh	1,433	4,878	874	46	828
	Subtotal	3,749	12,761	2,287	169	2,118

Table II-5.—Chapter water demand for the proposed project (2040) (continued)

Service area	Chapter	1990 population	2040 population	2040 demand (AFY) ¹	2040 ground- water production and ALP ²	2040 San Juan River depletion ³
					(AFY)	(AFY)
Route 491, NM	Mexican Springs	711	2,420	434	See Tohatchi	434
	Naschitti	1,539	5,238	939	77	862
	Newcomb	651	2,216	397	12	385
	Sanostee	2,081	7,083	1,270	153	1,117
	Sheep Springs	660	2,246	403	15	388
	Tohatchi	1,607	5,470	980	307	673
	Twin Lakes	1,967	6,695	1,200	153	1,047
	Two Grey Hills	883	3,005	539	77	462
	Subtotal	10,099	34,374	6,161	794	5,367
Torreon, NM	Counselor	1,365	4,646	833	0	833
	Ojo Encino	596	2,029	364	15	348
	Pueblo Pintado	472	1,607	288	0	288
	Torreon	1,364	4,643	832	61	771
	Subtotal	3,797	12,924	2,316	77	2,240
San Juan River, NM ⁴	Beclaibito	388	1,321	237	0	118
	Cudei	495	1,685	302	0	151
	Hogback	740	2,519	451	0	226
	Nenahnezad	1,253	4,265	764	0	382
	San Juan	540	1,838	329	0	165
	Shiprock	8,100	27,570	4,942	0	2,471
	Upper Fruitland	2,288	7,788	1,396	0	698
	Subtotal	13,804	46,985	8,421	4,680	1,871
Navajo Agricultural Products Industry, NM		N/A	N/A	7,274	N/A	700
NM Upper Basin		35,972	122,439	29,219	7,127	14,348
NM Lower Basin		30,807	86,861	15,568	2,114	13,934
Total New Mexico		66,779	209,300	44,788	9,241	28,282
Window Rock, AZ	Fort Defiance	6,187	21,059	3,774	767	3,007
	Saint Michaels	5,580	18,993	3404	See Fort Defiance	3,404
Total Arizona		11,767	40,052	7,179	767	6,411
Project total		78,546	249,352	51,967	⁵ 10,008	34,693

¹ Acre-feet per year.² Animas-La Plata Project.³ Depletions assume zero return flows to the San Juan River.⁴ San Juan River depletions do not include Animas-La Plata Project water.⁵ Water not supplied by the Navajo-Gallup Water Supply Project.

Table II-6.—Projected municipal demand (excluding Navajo Agricultural Products Industry) in the proposed project service area by basin (acre-feet)

Decade	New Mexico Upper Colorado Basin	New Mexico Lower Colorado Basin	New Mexico Rio Grande Basin	Arizona Lower Colorado Basin	Project total
2000	7,789	6,780	448	2,695	17,712
2010	9,951	8,333	573	3,442	22,299
2020	12,672	10,253	773	4,398	28,096
2030	16,241	12,628	936	5,619	35,424
2040	20,749	15,568	1,196	7,179	44,692
2050	26,509	19,214	1,528	9,171	56,422
2060	33,869	23,738	1,951	11,717	71,275

Per capita water use on Navajo Reservation lands varies depending on the accessibility of the water supply. Surveys in 1993 showed that 44 percent of Navajo households in the proposed project area are without direct access to a public water supply system and use very little water (Bureau of Reclamation [Reclamation], 1993). Per capita water use rates for homes without running water are estimated at 10 gpcd (Murray, 1965). It is estimated that families hauling water for domestic purposes spend the equivalent of \$22,000 per acre-foot compared with \$600 per acre-foot for a typical suburban water user in the region (Northwest Economic Associates, 1993a). In 2007, it was estimated that the cost of Navajo water hauling was \$113 per thousand gallons (volume II, appendix D, part II).

Billing data from the Navajo Tribal Utility Authority (NTUA) indicate that average use on the NTUA system is approximately 100 gpcd; on non-NTUA systems, it ranges from 20 to 100 gpcd. Low usage rates are often limited by system and supply constraints, not demand. Accordingly, a per capita use rate of 160 gpcd¹ was used for water resource planning at the request of the Navajo Nation.

The Navajo Agricultural Products Industry (NAPI) has plans for future projects, which require water. To support industrial diversification relating to an agricultural-related food processing plant by NAPI, the proposed project would provide 700 acre-feet of treated water per year.

¹ The 160 gpcd amount is customarily used in New Mexico for planning the municipal and industrial water supply.

Water Infrastructure

Existing local water conveyance systems are being upgraded and expanded. Figures IV-1 to IV-6 in chapter IV show existing NTUA lines within the proposed project area in relationship with various project alternatives. The Indian Health Service will design, fund, and oversee construction of most of these improvements. The systems will be turned over to the NTUA for ownership and operation and maintenance. A limited supply of quality groundwater constitutes a restriction in expansion of these systems to meet people's needs. Funding and housing density also limit expansion.

Regional systems such as this project will connect to these local systems to provide a good quality water supply. Improvements and expansions to these local systems will continue as in the past but with an adequate water supply.

City of Gallup

Problems currently encountered by the city of Gallup center on its use of two confined aquifers with water tables between 900 and 3,000 feet deep and two well fields in which static water levels are declining approximately 200 feet every 10 years. The city of Gallup needs to augment its groundwater supply; the level at the city's Ya-ta-hey Well Field has dropped by more than 800 feet since the 1970s, and the city anticipates a 1-million-gallon-per-day deficit by summer 2010.²

The city of Gallup is the economic and commercial center of a 15,000-square-mile trade area that includes parts of northwestern New Mexico and northeastern Arizona, including the surrounding Navajo and Zuni Reservations. The economy of the region is based on retail and wholesale trade; Federal, State, and local government agencies; tourism; light manufacturing; agriculture; and energy extraction industries.

The current limited water situation and its future availability are major concerns of area residents. The city of Gallup presently relies on a series of old wells previously owned by the Atchison, Topeka, and Santa Fe Railway. The city is also relying on a more recent field in the Ya-ta-hey area just north of the city of Gallup. The in-city wells, which are located in the Gallup Sandstone Aquifer that is highly dependent on recharge from local precipitation, have shown a substantial decrease in yield. Production has been reduced from 15 active to 9 usable wells, and the lowering yields have been accompanied by deteriorating quality and excessive pumping costs. Because of dependence on local

² The city of Gallup identified two short-term alternatives involving expansion of one well field and developing water to the east, but neither alternative is sustainable. Other sources have proven to be inadequate.

recharge for supply, the city of Gallup administration has assumed that the aquifer would have a safe annual sustained yield of only 2,000 acre-feet. Withdrawals in excess of this amount could lead to a “mining”³ aquifer condition.

Because of the severe limitation of the in-city well system, the city of Gallup began to develop the Ya-ta-hey Well Field as a supplemental supply. The estimated firm yield of this source is about 3,800 acre-feet per year (AFY), but could be less. Even with the full development of the combined well field system, current peaking requirements during heavy use periods severely tax the ability of the two well fields to meet the demands.

It appears that even without extensive industrial development in the area, the city of Gallup’s demand for domestic water will exceed present and potential supplies within the next decade. Beyond this point, the city must find alternative sources or possibly be faced with curtailing growth and/or instituting strict water rationing.

The city of Gallup’s present water supply problem is that of both quality and quantity. Groundwater is not an alternative that would meet the city’s goals to obtain a long-term good-quality supply. Their existing supply does not meet secondary water quality standards. Other groundwater sources in the area are also questionable from a yield and quality standpoint. Desalting or extensive treatment of groundwater would be expensive. The city of Gallup’s desire over the years has been to develop a good source of a dependable water supply that would sustain their long-term needs. By Resolution No. 24-51, June 13, 1967, the city of Gallup made a formal request for 15,000 AFY of water from Navajo Reservoir to the New Mexico Interstate Stream Commission. Following reviews and discussions of this request, the city was allocated 7,500 acre-feet in 1968. Secretarial approval was granted to the State of New Mexico for temporary water contracts from Navajo Reservoir.

JICARILLA APACHE NATION – PROBLEM IDENTIFICATION

The need for a dependable municipal and industrial water supply for the southwestern part of Jicarilla Apache Nation Reservation lands is tied to their desire for a basic infrastructure that would allow Tribal members to remain on reservation lands with a lifestyle they choose.

Formerly a widely dispersed population with cattle and sheep ranches, the Jicarilla Apache Nation began to focus on timber sales and the oil and gas industries in the

³ Mining refers to the condition that occurs when more water is being pumped out of the aquifer than is being replenished or recharged.

mid-1950s, with the population gradually moving into Dulce, New Mexico, the center of its government. The Jicarilla Apache Nation is now by far the largest employer for its people; Tribal members seeking alternative employment or post-secondary education must relocate off-reservation where an estimated 21 percent of the total Tribal population resides. The Jicarilla Apache Nation is striving toward a diversified economy that will permit Tribal members to work on the reservation.

Economic development for the Teepee Junction area centers on an existing casino and planned travel service center and accompanying businesses at and near the U.S. Highway 550/State Road 537 junction, where Jicarilla-refined fuel would be sold at retail and possibly wholesale prices and an estimated 400-plus jobs could be created. In addition, the Jicarilla Apache Tribal Utility Authority may ultimately develop a 100-megawatt, gas-fired “merchant” plant that could supply local power needs and also sell wholesale power on the open market. A major barrier to planning for the Teepee Junction area has been the lack of a reliable, high-quality water supply.

JICARILLA APACHE NATION – PROBLEM QUANTIFICATION

The Tribal Office of Integrated Resource Management (IRM) has prepared estimated population growth figures based on 2000 U.S. Census data adjusted for an undercount estimated at 12 percent based on the actual undercount rate determined for the 1990 census and confirmed by housing counts. Historical population growth has varied by decade in the range of 1.1 percent to 1.8 percent per year. For planning purposes and for this planning report and draft environmental impact statement, the population growth rate of 1.7 percent per year is assumed. It is also assumed that if there were adequate housing and employment opportunities on-reservation, the rate of those residing off-reservation would fall to 10 percent at any given time by 2020. The data in table II-7 were provided by IRM.

Table II-7.—Population projections for the Jicarilla Apache Nation

	1990 ¹	2000 ²	2010	2020	2030	2040
On-reservation	2,730	3,283	3,836	4,389	4,942	5,495
Off-reservation	425	694	575	440	494	550
Total	3,155	3,977	4,411	4,829	5,436	6,045

¹ Based on 1990 U.S. Census count of 2,438 for Dulce with a 12-percent increase. The U.S. Census estimated a 12-percent undercount for the Jicarilla Apache Reservation in 1990.

² Based on August 2000 IRMP Housing Count of 878 occupied housing units in Dulce and an average household size of 3.74 persons from the Jicarilla Income and Housing Survey conducted by the Office of Community Development in August 2000.

Water Demand

Water demands are based on the assumption that the average occupancy per household will fall from 3.74 to 3.00 as a result of fully meeting the housing demand and increasing prosperity of the Jicarilla Apache people. The per capita use is assumed to be 160 gallons per day (this figure was used for planning purposes by Reclamation in the Dulce Water and Wastewater Systems Environmental Assessment [Reclamation, 2001]).

Table II-8 illustrates the Jicarilla Apache Nation’s anticipated water needs for the Teepee Junction areas that would be served by the proposed project.

Table II-8.—Projected water needs for the Jicarilla Apache Nation

Water demands (AFY)	2002¹	2010	2020	2030	2040
Casino/travel center	30	50	70	70	70
Power generation	0	750	750	750	750
Housing	11	48	105	156	231
Other uses ²	50	50	60	80	110
Total³	91	898	985	1,056	1,161

¹ These uses include anticipated groundwater use for facilities planned for 2002, U.S. Highway 44 road construction, and oil and gas water leases. It is assumed that this groundwater demand would shift to surface water provided through the proposed project once water was available.

² Other use categories include miscellaneous sales for construction, oil and gas production, drought relief for livestock operators and wildlife, nonmetered losses, and additional small commercial development as significant housing develops.

³ The Teepee Junction area population is estimated at 585 persons in 2020 and 1,290 persons in 2040. Water demands above the amount that the pipeline could provide beyond 2040 would be met using treated groundwater developed locally.



Chapter III

OPPORTUNITIES/RESOURCES AND CONSTRAINTS

Introduction
Proposed Project Water Opportunities/Resources and Issues
Navajo Nation
Jicarilla Apache Nation
City of Gallup

INTRODUCTION

This chapter describes Navajo-Gallup Water Supply Project (proposed project) opportunities and constraints for meeting water demand needs identified in chapters I and II. Water supply options and limitations are also analyzed.

A primary project opportunity includes adequate San Juan River water supplies for project depletion without jeopardizing endangered fish and their habitat. Another opportunity includes the ability to acquire private water rights for the proposed project use that would remain within the State of New Mexico's Upper Colorado River Basin allocation. Other opportunities include possible use of water from the Navajo Indian Irrigation Project (NIIP), Jicarilla Apache Tribe Water Rights Settlement Act (Jicarilla Settlement Act) (Public Law [P.L.] 102-441, 106 Stat. 2237) of 1992, and the Arizona Upper Colorado River Basin Compact allocation.

Project constraints include the need for water contracts, a hydrologic determination of water availability in New Mexico for Navajo Reservoir, Endangered Species Act (ESA) compliance, restrictions on NIIP water use, and related limitations.

Water supply or resource constraints include the groundwater overdraft problem, lack of infrastructure, and the lack of groundwater on the Navajo Nation Reservation; unsustainable groundwater supplies in the city of Gallup; and the lack of adequate water supply infrastructure for development in the southwest part of the Jicarilla Apache Reservation.

PROPOSED PROJECT WATER OPPORTUNITIES/ RESOURCES AND ISSUES

With more than 40 percent of the Navajo population lacking domestic water, and static water levels in the city of Gallup's well fields declining by hundreds of feet, the need for an alternate surface supply is clear. Numerous investigations have found that additional groundwater sources are inadequate and that they can only temporarily delay water supply shortfalls.

Sources of surface water that were considered for the proposed project demand within New Mexico include:

- (1) Acquisition of private water rights.
- (2) A San Juan River contract for water with the U.S. Department of the Interior (Interior).
- (3) A San Juan River contract for water from the Jicarilla Apache Nation.
- (4) NIIP water.
- (5) Navajo Nation non-NIIP water. Approximately 18 percent of the proposed project's water demand is in the Lower Colorado River Basin within the State of Arizona. In providing for Navajo Reservation, Window Rock, and Arizona area demands, the Navajo Nation is investigating water from three sources: the Central Arizona Project (CAP), Arizona Lower Basin, and Upper Basin Colorado River. Water from the three sources may be physically available to meet the proposed project's Arizona water demand, but legal and administrative issues are limiting constraints.

These water supply options are discussed in greater detail below. Additional text has been added to each option to illustrate how the recently enacted P.L. 111-11 and an executed settlement agreement may affect each option.

Proposed Project Water Supply in New Mexico

Acquisition of Private Water Rights

One option for providing a permanent water supply for the city of Gallup is to purchase private water rights from water users within the San Juan River Basin (Basin). Considering the potentially available water rights in the Basin, it is unlikely that the city's entire anticipated depletion of 7,500 acre-feet could be available from privately held

water rights that are currently being used. Only a portion could be feasibly available. Private water rights would have the advantage of being currently considered depleted in the baseline hydrology for endangered species consultation, could have a senior priority date, and would be within the State of New Mexico's water allocation within the Upper Colorado River Basin.

Disadvantages include not having a full water supply every year and not having reservoir storage. Depletions associated with these water rights would have to be transferred to the proposed project. It is very likely that these transfers would be protested by numerous parties within the Basin because of potential injury to use of their water or the welfare of the State. A final disadvantage is that private water rights within the Basin, even those purchased and administratively moved to the city of Gallup, might not be exempt from a priority call based upon federally reserved water right claims exerted by the Navajo Nation.

The New Mexico Interstate Stream Commission estimates that the alternative water supply provision of the settlement agreement between the Navajo Nation and the State of New Mexico reduces the likelihood of a priority call from 1 year out of 2 to 1 year out of 20.

A San Juan River Water Contract with the U.S. Department of the Interior

The city of Gallup has no water rights for San Juan River water, nor does it have any Navajo Reservoir water under contract. During the 1950s and 1960s, Gallup filed three Notices of Intent to divert water from the San Juan River. After the construction of Navajo Reservoir, the New Mexico State Engineer indicated that the city of Gallup would need a contract with the Secretary of the Interior (Secretary) for water. In 1966, a contract for 7,500 acre-feet of water was drafted and several meetings were held between the Bureau of Reclamation (Reclamation) and the city of Gallup to work out the details. That contract was never finalized. In 1967, the New Mexico Interstate Stream Commission recommended, and the Secretary granted, a temporary allocation to the city of Gallup of 7,500 acre-feet per year (AFY) through the year 2005. In the 1988 Hydrologic Determination, Reclamation identified 24,000 acre-feet of water in New Mexico and 7,000 acre-feet of water in Arizona that was temporarily available from the San Juan River for the proposed project through the year 2039. A letter (November 22, 2000) from Kelsey A. Begaye, President of the Navajo Nation, and John Peña, Mayor of the city of Gallup, to Eluid Martinez, Commissioner of Reclamation, and the project participants, requested separate water contracts from the Navajo Reservoir water supply (attachment G). The Navajo contract would be for 29,300 AFY and the city of Gallup contract would be for 7,500 AFY.

A letter (December 26, 2000) from the Commissioner of Reclamation and a letter (June 13, 2001) (attachment H) from the Upper Colorado Regional Director agree with

working toward water supply contracts from Navajo Reservoir. The letters identified the following unresolved issues that would have to be addressed before pursuing long-term water supply contracts:

- Hydrologic determination of water availability in New Mexico from Navajo Reservoir
- ESA compliance for any Federal action to contract and provide water
- National Environmental Policy Act (NEPA) compliance for the contracts and the proposed project to provide the water
- Colorado River Basin issues relating to diverting and depleting water in New Mexico and Arizona
- Congressional authorization of the construction and operation of the proposed project
- Congressional approval of long-term contracts from Navajo Reservoir
 - The Act of June 13, 1962 (76 Stat. 96, P.L. 87-483), authorizing the NIIP and the San Juan-Chama Project, provides in section 11 that the Secretary shall not enter into long-term contracts for the delivery of water from Navajo Reservoir until (1) it has been made certain by hydrologic determinations as to water availability, (2) such determinations have been submitted to Congress, and (3) Congress has approved such contracts. The act also authorized the Secretary to market water from Navajo Reservoir for other municipal and industrial (M&I) uses in New Mexico if it is determined on the basis of hydrologic investigation that such water is reasonably likely to be available.

A hydrologic investigation (hydrologic determination) was completed by Reclamation and a resolution dated June 9, 2006, was passed by the Upper Colorado River Commission (attachment E). The hydrologic determination was signed by the Secretary on June 8, 2007, and is included as attachment N. Projections by the State of New Mexico in May 2006 show the State not exceeding 642,400 AFY through 2060 with full development of this proposed project (table I-1). Based on the hydrologic determination, sufficient water is reasonably likely to be available within New Mexico's Upper Basin apportionment and from the Navajo Reservoir water supply for the Secretary to enter into a long-term water supply contract for the Navajo Nation's uses in New Mexico under the proposed project. There is no water anticipated to be available from New Mexico's Upper Basin apportionment and the Navajo Reservoir water supply

for a long-term contract between the city of Gallup and the Secretary. However, the city of Gallup may subcontract with the Navajo Nation or the Jicarilla Apache Nation, or both, for part of their Navajo Reservoir supply contract allocations.

ESA Compliance.—Formal section 7 (endangered species) consultation has been completed for construction, operation, and issuance of long-term water supply contracts for the proposed project. Reclamation, the action agency, submitted a biological assessment, which was accepted as complete, initiating formal consultation with the September 22, 2005, letter from the U.S. Fish and Wildlife Service (Service). The Service issued a final biological opinion on February 26, 2009 (volume II, appendix C, part III.)

A key element in the action to reduce impacts to the endangered fish on the San Juan River is a depletion guarantee provided by the Navajo Nation. The Navajo Nation offered to reduce its water depletion as necessary up to 20,782 AFY to alleviate impacts to the San Juan River Basin Recovery Implementation Program (SJRBRIP) that could be created by the full development of the proposed project. Such a depletion guarantee was developed by the Nation along with both Reclamation and the Service. Because it involves voluntary limitations on the Nation’s use of water as it regards potential effects to endangered species, and because Reclamation, as the action agency, is prepared to administer and operate the proposed project under such potential limitations, such a guarantee is entirely within the requirements of the ESA and the principles of the SJRBRIP. This is an example of other potential ways this proposed project might be constructed and operated under the rubric of the ESA and the SJRBRIP. An additional description of the Navajo Depletion Guarantee is provided in chapter VI.

NEPA.—This planning report and final environmental impact statement (PR/FEIS) covers NEPA compliance for construction and operation of the recommended alternative and required water supply contracts from Navajo Reservoir.

Colorado River Basin Issues in New Mexico and Arizona.—The project proposes to divert water from the Upper Colorado River Basin out of the San Juan River in New Mexico. Approximately 39 percent (13,934 AFY) of the depleted water would be used in New Mexico’s Lower Colorado Basin. Approximately 18 percent of the depleted water would be used in Arizona’s Lower Colorado Basin. The Upper Colorado River Commission passed a resolution on June 19, 2003, in support of the diversion of water from the Upper Basin for use in the Lower Basin in New Mexico for the proposed project (attachment E). Public Law 111-11 (see attachment P) states that proposed project water shall not be delivered for use by any community of the Navajo Nation located in Arizona until the:

1. Navajo Nation and the State of Arizona have entered into a water rights settlement agreement approved by an Act of Congress that settles and waives the Navajo Nation's claims to water in the Lower Basin and the Little Colorado River Basin in the State of Arizona, including those of the United States on the Navajo Nation's behalf; and
2. Secretary and the Navajo Nation have entered into a Navajo Reservoir water supply delivery contract for the physical delivery and diversion of water via the proposed project from the San Juan River system to supply uses in the State of Arizona.

Congressional Authorization of the Proposed Project.—The proposed project authorization was included in the recently enacted Omnibus Public Land Management Act of 2009, title X, part III (P.L. 111-11, March 30, 2009). The act authorizes the Secretary to:

1. Construct, operate, and maintain the proposed project
2. Allocate the capacity of the proposed project among the Navajo Nation, Jicarilla Apache Nation, and the city of Gallup
3. Enter into proposed project repayment contracts with the city of Gallup and the Jicarilla Apache Nation

In general, the Secretary, acting through the Commissioner of Reclamation, is authorized to design, construct, operate, and maintain the proposed project in substantial accordance with the preferred alternative in the draft environmental impact statement.

Public Law 111-11 approved, ratified, and confirmed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (Navajo Settlement Agreement) under title X, part IV of the act. This PR/FEIS does not analyze the Navajo Settlement Agreement; however, the act requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010.

Congressional Approval of Long-Term Water Supply Contracts.—Long-term water contracts for water from Navajo Reservoir require congressional authorization. Public Law 111-11, as mentioned above, includes authorization language for entering into long-term water supply contracts for water from Navajo Reservoir and the San Juan River. This includes water supply contracts between the Navajo Nation and the Secretary for the Nation's uses under the proposed project and any subcontract between the city of Gallup and the Navajo Nation for the city's uses under the project.

Contract Water from the Jicarilla Apache Nation

Under the 1992 Jicarilla Settlement Act and associated Federal contract, the Nation has the right to deplete 25,500 AFY from the Navajo Reservoir supply and the right to subcontract this water when it is not needed for on-reservation use. The Jicarilla Apache Nation is pursuing a variety of development options for using its San Juan River Basin depletions, including potential third-party contracts and on-reservation water projects.

The Jicarilla Apache Nation has a contract right to water under the Navajo Reservoir supply. The Secretary has already determined that sufficient water is available to fulfill the Jicarilla Settlement Act. While third-party contracts for Jicarilla Apache Nation water must be approved by the Secretary (through Reclamation), no further congressional action is necessary for subcontracting the use of its water. In addition, these depletions will be recognized in future hydrologic determinations.

Navajo Indian Irrigation Project Water

The NIIP was authorized in 1962 by P.L. 87-483. This law authorized the Secretary to construct, operate, and maintain the NIIP for the principal purpose of furnishing irrigation water to approximately 110,630 acres of land. The NIIP consists of the initial land development, water distribution system, water delivery, roads, and other infrastructure. In 1970, the Navajo Nation created the Navajo Agricultural Products Industry (NAPI) to run the agricultural business venture and take responsibility for operating the NIIP facilities.

The NIIP is approximately 70 percent complete, with 77,685 acres developed. Based on an average unit depletion of 2.44 acre-feet per acre, at full build-out, with all of the proposed project acreage irrigated, the NIIP would deplete approximately 270,000 AFY of San Juan River water. Based on current overall project irrigation efficiency, the NIIP would divert approximately 337,500 acre-feet of water (Bureau of Indian Affairs, 1999).

The NIIP, through the Bureau of Indian Affairs, consulted with the Service on approximately 270,000 acre-feet of depletion which, according to the Service, can be depleted without jeopardizing the endangered fish. However, the NIIP was only able to acquire the water it needs to complete Blocks 9, 10, and 11 by shifting more than 16,000 acre-feet of baseline depletions away from the Hogback and Fruitland irrigation projects. Even so, the NIIP's depletions may include two types of water that may, under certain circumstances, be available for municipal use: (1) unused NIIP water and (2) water made available by forbearing the use of NIIP irrigation water. These options, which would need to overcome considerable legal and political hurdles, are described in the following sections.

Municipal Use of Unused NIIP Water.—The authorized purposes of the NIIP facilities include conveying water for municipal, domestic, and industrial uses, and for other beneficial purposes. The Secretary is authorized to provide capacity for M&I water supplies or miscellaneous purposes over and above the diversion requirements for irrigation of the NIIP. However, the additional capacity needed would not be constructed and no appropriation of funds for such construction would be made until contracts have been executed that provide satisfactory assurance of repayment of all costs properly allocated.

Even if the Navajo Nation were willing to convert unused NIIP water from irrigation uses to municipal uses, under the present contract the Secretary is not authorized to deliver water for uses other than irrigation. The NIIP’s statutory authorization and the Navajo Nation’s contract with the Secretary allocate an average annual diversion of up to 508,000 acre-feet of water per year from the San Juan River for the principal purpose of furnishing NIIP irrigation water to approximately 110,630 acres of land. The Secretary has authority to contract for delivery of water from Navajo Reservoir provided that unreasonable shortages to the NIIP and the San Juan Chama Project are avoided.

A more critical issue is that the unused NIIP water is only temporarily available, perhaps for a 10- to 30-year period. The municipal demand, however, requires a long-term supply. Committing this water temporarily to non-NIIP municipal water demand would create significant disincentives for the completion of the NIIP, and it might eventually result in a conflict between irrigation and municipal uses. Even with these concerns, the unused NIIP water might allow the proposed project to proceed.

A Forbearance Agreement for NIIP Water.—Another water supply option is for the Navajo Nation to enter into a forbearance agreement to provide water for municipal needs. Unlike the “unused” water described in the previous section, under a forbearance agreement, the NIIP would forbear the use of a specific volume of water that it could otherwise make use of for a designated period of time. This foregone use might come at the expense of not irrigating a specific number of acres. Based on an average depletion of 2.44 acre-feet per acre, the city of Gallup water supply would require idling or fallowing approximately 3,000 acres, and the Navajo demand would require approximately 10,000 acres.

Instead of idling acreage, it might be possible to change the proposed crop mix to include crops that require less water or to underirrigate some of the irrigated crops in the current mix. However, these approaches would have agronomic impacts on the NIIP, including lower revenue, fewer jobs, and greater risk of crop failure. From the State of New Mexico’s perspective, agricultural water rights can only be transferred from irrigated land if the irrigated land is fallowed or dry-farmed.

In conclusion, although a relatively large amount of water under the NIIP has undergone section 7 consultations and other environmental compliance, forbearance agreements for NIIP water have to be developed around the current contractual constraints and without creating disincentives to the completion of the NIIP. However, this option might provide a bridge until broader water issues are resolved.

Public Law 111-11 provided amendments to the NIIP authorizing legislation (P.L. 87-483, as amended by P.L. 91-416) which, in addition to irrigation, allows the water diverted by the NIIP (the quantity of water necessary to supply an average depletion of 270,000 acre-feet per year) to be used within the area serviced by NIIP facilities for (1) aquaculture, (2) domestic, industrial, or commercial purposes relating to agriculture production and processing, (3) hydropower, and (4) the implementation of the alternative water source provisions described in subparagraph 9.2 of the settlement agreement executed under the Northwestern New Mexico Rural Water Projects Act (P.L. 111-11, title X, subtitle B).

The P.L. 111-11 amendments also state that NIIP water diverted may be transferred to areas located within or outside the area served by NIIP facilities, and within or outside the boundaries of the Navajo Nation, for beneficial use in accordance with the executed settlement agreement, settlement contract, and other applicable law. The Secretary may also use the capacity of the NIIP works to convey water supplies for the proposed project or other non-irrigation purposes described above. The Northwestern New Mexico Rural Water Project Act is included as attachment P (P.L. 111-11, title X, subtitle B).

Other Navajo Nation Water

One option to provide a water supply for the proposed project would be for the Navajo Nation to assume the responsibility for guaranteeing depletions out of water supplies allocated to the Navajo Nation, either through existing statutes or an eventual final settlement of the Navajo Nation's federally reserved water claims. Such an approach would not require the city of Gallup to deal directly with Basin interests and would provide the Navajo Nation the opportunity to redistribute its water resources consistent with its internal policies. The primary disadvantage with this approach is that the Navajo Nation has very limited non-NIIP water in the Basin with a quantified water right and with the potential for leasing to the city of Gallup. For instance, as a result of its section 7 consultation with the Service, unused water from the San Juan River irrigation projects has already been temporarily utilized by the NIIP to ensure that the NIIP's construction can continue. When this depletion is restored to the Shiprock irrigation projects, it may, under certain circumstances in the future, be available for the proposed project. However, utilizing Navajo Nation water to meet non-Navajo municipal demands raises issues that would need to be addressed.

The Navajo Nation is concerned that using other Navajo Nation water for temporary use for the proposed project might hinder other future Navajo water development. Even if other Navajo Nation water became available under favorable terms, it would not necessarily be less expensive than acquiring private water rights. Consequently, in the short term, this water option may not meet the city of Gallup's need to secure a long-term water supply. A Memorandum of Understanding dated October 2007 between the Navajo Nation and the city of Gallup addresses a potential water supply for the city of Gallup (attachment B).

Proposed Project Water Supply in Arizona

Central Arizona Project or Other Main Stem Arizona Lower Basin Colorado River Water

Water allocated to the Lower Colorado River Basin might fit most readily into existing compact allocations for use in such Lower Basin areas as Window Rock, Arizona. The Arizona Water Settlements Act, which became law in December 2004, identified 6,411 acre-feet of CAP water for use by the Secretary in settlement of the Navajo Nation's water rights in Arizona. Other possibilities are to acquire non-CAP main stem water or lower priority non-municipal water.

Moving CAP water or other main stem Colorado River water would require an adequate accounting system to ensure that system gains and losses were accurately calculated and that other issues, such as lost power revenues and environmental impacts, were addressed.

Arizona Upper Colorado River Basin Water

The Upper Colorado River Basin Compact of 1948 provided Arizona 50,000 AFY of annual consumptive use from the Upper Basin. The 1988 Hydrologic Determination identified 7,000 acre-feet of water in the Upper Basin of Arizona for the Arizona portion of this project. Arizona's estimated water depletion in 2000 was 38,100 acre-feet (Reclamation, 2004). The *Colorado River System Consumptive Uses and Losses Report, 1996–2000* shows there is currently adequate water remaining in Arizona's Upper Basin apportionment to meet the proposed project's Arizona demand. Other demands for this water, such as the 950 acre-foot request by the Navajo Nation, and the 1,000 acre-foot request by the city of Page, Arizona, must be considered. The Navajo Generating Station has been fully developed and its water depletion is included in Arizona's annual consumptive use from the Upper Basin. An additional 5,400 acre-feet of depletion remains unused from the station's water supply contract from Lake Powell. The Navajo Nation and the State of Arizona will need to identify how the remaining unused water will be divided.

Public Law 111-11 (see attachment P) requires that water diverted by the proposed project in New Mexico be in accordance with an appropriate permit issued under New Mexico law for use in the State of Arizona within the Navajo Reservation in the Lower Basin, provided that any depletion from the diversion by the proposed project in New Mexico for use in Arizona shall be administered and accounted for as either:

1. A part of, and charge against the available consumptive use apportionment made to the State of Arizona by the Upper Colorado River Compact and Colorado River Compact, in which case any water diverted by the proposed project into the Lower Basin shall not be credited as water reaching Lee Ferry pursuant to the Colorado River Compact; or
2. Part of, or charged against the consumptive use apportionment made to the Lower Basin by the Colorado River Compact, in which case it shall be:
 - a. Part of the Colorado River water that is apportioned by the State of Arizona in the Consolidated Decree of the Supreme Court of the United States in *Arizona v. California* (547 U.S. 150) (as may be amended or supplemented)
 - b. Credited as water reaching Lee Ferry pursuant to the Colorado River Compact; and
 - c. Accounted for as water identified in the Arizona Water Settlement Act (118 Stat. 3478).

NAVAJO NATION

Existing Opportunities/Resources

Outside the San Juan River chapters in the northern part of the proposed project area, Navajo Nation communities in the region and the city of Gallup rely entirely on groundwater for their water supply. The public water systems in the proposed project service area derive water from a variety of groundwater sources ranging from shallow, unconfined aquifers to deep, confined aquifers, as shown in table III-1.

There were more than 50 public water supply systems in the proposed project area in 1996 (Navajo Nation Environmental Protection Agency), the largest of which was the Navajo Tribal Utility Authority, which operates more than 30 water systems in the area. The Navajo Department of Water Resources operates nine systems in the proposed project area. Descriptions of groundwater conditions in the subareas and constraints to the use of that groundwater are presented in detail in volume II, appendix A (Rodgers, 1993) (Navajo Nation Environmental Protection Agency, 1996).

Table III-1.—Proposed project service area municipal water production during 2005

Municipal subarea	Production (acre-feet)	Source aquifer
1. City of Gallup	3,460 (2006)	Gallup Sandstone Dakota-Westwater
1. Central	28	Alluvium Picture Cliffs Menefee
2. Crownpoint	439	Westwater Morrison Menefee Gallup Sandstone Point Lookout
3. Gallup area (Navajo land adjacent to the city of Gallup)	389	Gallup Sandstone Dakota-Westwater
4. Huerfano	88	Alluvium Ojo Alamo
5. Rock Springs	95	Gallup Sandstone
6. Route 491	767	Alluvium Morrison Menefee Point Lookout Gallup Sandstone Mesa Verde Dakota
7. San Juan River	2,181 (2004)	Surface Water
8. Torreon	166	Ojo Alamo
9. Window Rock	991	Alluvium De Chelly Gallup Sandstone Shinarump
10. Thoreau-Smith Lake	208	Glorieta
Regional total	8,812	

Source: Navajo Tribal Utility Authority and city of Gallup.

Constraints

Most of the aquifers investigated are undesirable for additional long-term municipal development because of the harmful impacts of continued over-drafting of the groundwater. Continued over-drafting of the groundwater may:

- Lower the water levels in wells and increase pumping depths
- Reduce the yield of the well fields
- Reduce the quality of the water supply
- Increase capital and operating costs
- Deplete the groundwater available for a drought reserve
- Lower the water table in riparian areas
- Cause land subsidence

JICARILLA APACHE NATION

Existing Opportunities/Resources

The water resources of the Jicarilla Apache Nation are shaped in part by the Jicarilla Settlement Act (P.L. 102-441, 106 Stat. 2237). Through years of litigation and negotiation with the United States, the Jicarilla Settlement Act was passed into law in 1992.

Beginning in 1972, the Jicarilla Apache Tribal Council initiated efforts to address its future water right needs by filing a Federal lawsuit. The Jicarilla Settlement Act, the associated Federal contract, and the Partial Final Decree in the San Juan River adjudication entered in 1999 entitled the Jicarilla Apache Nation to a number of water rights, including the following:

- The right to divert up to 40,000 acre-feet and deplete up to 25,500 acre-feet from the Navajo Reservoir water supply under contract with the Secretary
- The right to deplete up to 6,500 acre-feet of water from the San Juan-Chama Project under contract with the Secretary
- Secured rights in Federal and State court to quantified historic and existing uses of water in both the San Juan and Rio Grande Basins

Part of these quantified historic and existing use rights are designated as 2,195 acre-foot depletions from the Basin for irrigation and domestic uses. An additional 2,187 acre-feet

of historic and existing uses, established for net evaporation on lakes and stock ponds, may be used for future domestic needs as determined by the Jicarilla Apache Nation. These water rights, as well as a substantial portion of its Federal contract water rights for future uses, are reflected in the environmental baseline established during the Animas-La Plata section 7 consultations under the ESA.

The proposed project's 1,200 acre-foot water demand for the Jicarilla Apache Nation would be met by delivery of a portion of their 25,500 acre-foot contract allocation from the Navajo Reservoir water supply as a result of the Jicarilla Settlement Act water rights and/or a portion of their unused historical rights. Contingent upon successful negotiation of a subcontract between the Jicarilla Apache Nation and the city of Gallup, the 7,500 acre-foot demand for the city would be met from deliveries from the Navajo Reservoir water supply under the Jicarilla Apache Nation's settlement contract. The Secretary would need to approve the subcontract.

Constraints

One of the major impediments for development planning in the southwest part of the Jicarilla Apache Reservation has been a lack of a reliable, high-quality water supply.¹ Previous planning efforts have investigated the possibility of diverting water from the Navajo River to Heron Lake and pumping the Jicarilla Apache Nation's surface water rights by pipeline to points south for development purposes. However, pipeline projects from these sources to the Teepee Junction area are very costly and have not been pursued.

In addition, by providing leased water to the city of Gallup, revenues from this source would provide the funding necessary to pay for development and operations and maintenance costs associated with the Jicarilla Apache Nation's proportional share of these expenses. By participation in the proposed project, the Jicarilla Apache Nation may be able to realize its development goals with water delivered to the desired location in a relatively cost-efficient manner in partnership with the Navajo Nation and the city of Gallup.

¹ Pockets of groundwater are available for small-scale development; however, treatment is required to provide water to drinking standards. For significant development, substantial groundwater mining would be necessary, making this source unreliable for the long term. Sustainable groundwater use can be obtained by dispersing the impacts to the aquifer(s), using small-volume wells, and using poorer quality water for stock operations, wildlife, other agricultural uses, and remote domestic supplies.

CITY OF GALLUP

Existing Opportunities/Resources

City of Gallup records for 2006 reported an average daily water production of 3.08 million gallons per day, or 3,460 AFY. The maximum daily use peaked at approximately 5.5 million gallons per day. Annual water demand has been decreasing over the past several years as a result of increased water conservation and management efforts, as shown in figure III-1.

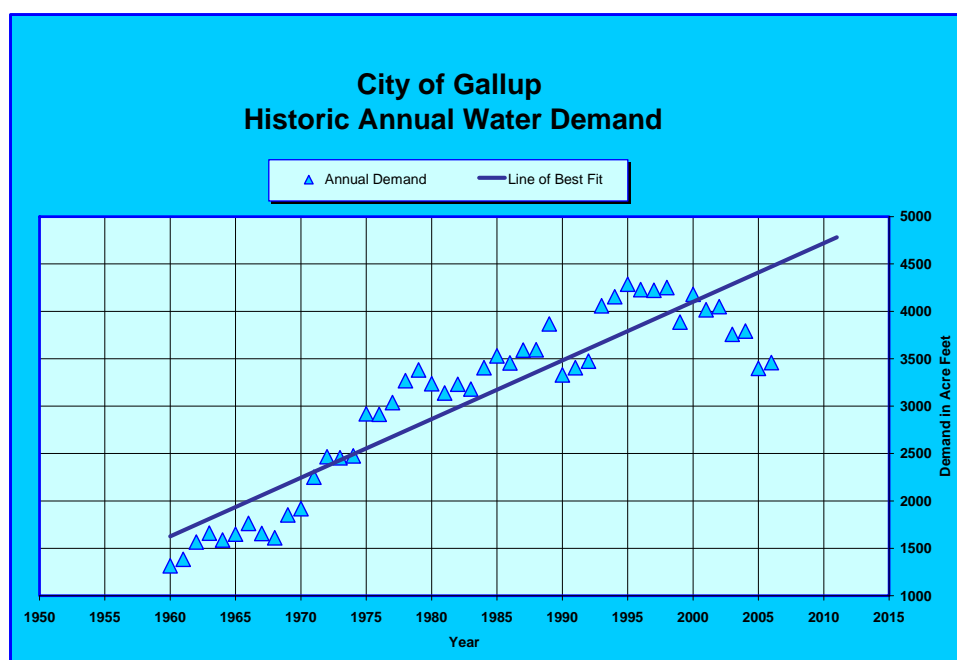


Figure III-1.—City of Gallup historic annual water demand.

The city of Gallup operated two well fields—the Santa Fe and the Ya-ta-hey. Historic water table data indicate that the static water level in its wells is declining at the average rate of 200 feet per 10 years (figure III-2). It is projected that in the next decade, current demands may not be met by the existing water supply.

In 1991, the city of Gallup's 40-year master water supply plan (Shomaker, Inc., 1991) identified two short-term alternatives, including the expansion of the Ya-ta-hey Well Field to the north and developing water in the Ciniza area to the east. Neither alternative is sustainable; however, plans are being developed to utilize those resources. The city of Gallup has also investigated new appropriations of San Andreas Glorietta water from an application acquired by the Plains Electric Generation and Transmission Cooperative (Plains Electric). Plains Electric Application Nos. G-22 through G-22-S-58 were

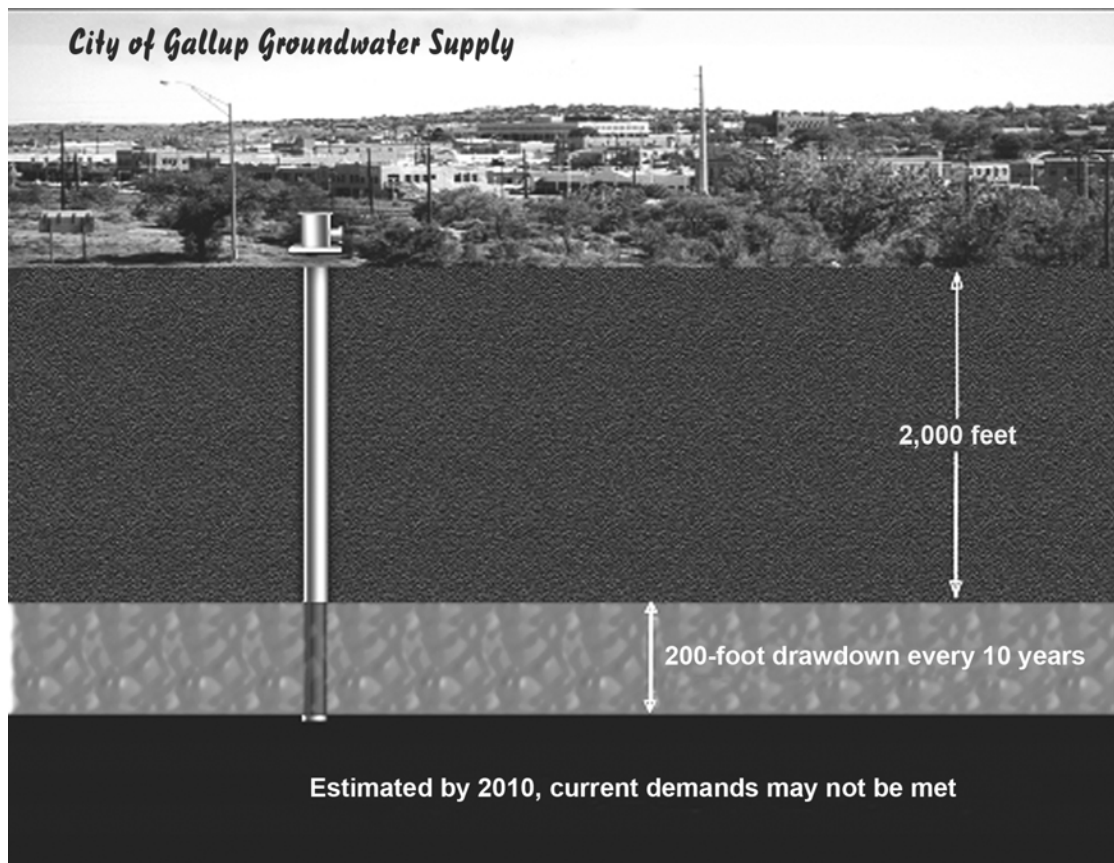


Figure III-2.—City of Gallup static water table.

intended to appropriate 7,000 acre-feet of water from wells located between Gallup and Grants for power generation. In 1982, the Office of the State Engineer issued an order limiting the maximum withdrawal of water under the permit to 5,000 AFY. In 1988, the application was broadened to expand the purpose and place of use to include the city of Gallup water service area, and Plains Electric was subsequently dismissed as a party after Gallup acquired the application. Numerous entities protested the application. The city of Gallup is developing a Plan of Replacement that is intended to address those objections.

Application No. G-22-PR has been amended once again to include southern chapters of the Navajo Nation. The Navajo Nation and the city of Gallup reached a settlement resolving the Navajo Nation's objections. Assuming other protests can be satisfactorily addressed, the "G-22" water supply may be able to provide a partial short-term water supply for the city of Gallup and the Navajo Nation until the proposed project is completed. In 1976, the U.S. Geological Survey completed groundwater investigations of the nearby Zuni Mountain and Malpais Region and the Westwater Canyon Aquifer in the vicinity of Church Rock. The results indicated that the groundwater resources of those areas are inadequate to meet the M&I needs for the city of Gallup. These findings

have been reiterated in numerous studies conducted since that time. In 1998, the city of Gallup collaborated with Reclamation and the Pueblos of Acoma and Laguna on an investigation of using existing de-watering wells at the inactive Mount Taylor Mine located near San Mateo, New Mexico. In a technical appraisal (Reclamation, 1999), Reclamation estimated that a 4,000 acre-foot yield is possible for a 40-year period. The water source is approximately 70 miles from the city of Gallup and 43 miles from the Pueblo of Laguna. The Mount Taylor Project would create large cones of depression that could trigger objections by local interests.² The Mount Taylor Project is not sustainable and does not meet the purpose and needs of the proposed project (Reclamation, 1999).

Constraints

Based on the various water supply studies for the city of Gallup over the past several decades, it can be summarized that the groundwater sources cannot be expected to provide a truly permanent supply. A surface water supply should be sought. The San Juan River offers the best hope because of the reliability of the supply, and the potential for a very long life, and because it is the closest surface water source. The city currently has no surface water supply but is working with the Navajo and Jicarilla Apache Nations for a long-term supply contract.

The city of Gallup has a relatively low rate of water consumption at 154 gallons per capita per day and has recently instituted an inclined water rate structure to help reduce consumption. An extensive water education program is active throughout the city of Gallup. Most outdoor irrigation in the city is done with treated waste water from the city's municipal waste water system. The city is investigating the feasibility of treating municipal waste water for a broader range of reuse and possibly for drinking. Although there is still potential for more conservation, the obvious conservation methods are already in place.

² Pumping from a well in a water table aquifer lowers the water table near the well, which is known as a cone of depression.



Chapter IV

ALTERNATIVES

Introduction
Plan Formulation Process
The No Action Alternative
Nonstructural Alternatives
Structural Alternatives
Other Alternative Cost Attributes
Screening Process
Alternatives Considered but Eliminated
Preferred Alternative Selection

INTRODUCTION

The first part of this chapter of the Navajo-Gallup Water Supply Project (proposed project) planning report and final environmental impact statement describes the eight alternatives that were considered for meeting the water demand needs presented in preceding chapters. The eight alternatives fall into three categories: no action, nonstructural, and structural. A No Action Alternative is included and an environmentally preferred alternative is identified, as required by the National Environmental Policy Act (NEPA) of 1969, for comparison with all action alternatives. A nonstructural Water Conservation Alternative (includes water reuse) and six structural alternatives are also described.

The second part of this chapter explains the methods used to screen out some of the eight alternatives that did not meet the proposed project purpose and need. Overall, the plan formulation evaluation process included the following steps, some of which were discussed in detail in the preceding chapters of this document:

- Identifying existing and projected problems and needs
- Evaluating resource capabilities
- Formulating alternative plans to solve problems and meet needs with available resources

- Analyzing the alternative plans to determine the advantages and disadvantages of each
- Selecting the preferred alternative from among viable alternatives

The plan selection process (also referred to as screening) included two categories of screening criteria under the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Principles and Guidelines)*.¹ The first category involved four tests of viability. The second category included nine factors covering the four accounts (national economic development [NED], environmental quality [EQ], regional economic development [RED], and other social effects [OSE]). Under the four tests of viability, the Water Conservation and No Action Alternatives and the six 2020 design capacity alternatives did not meet initial screening criteria.²

Only the six structural alternatives at the larger year 2040 capacity adequately met the proposed project purpose and need. Of the six alternatives, through the screening process, two were found to have the lowest cost as measured by their present worth. These two action alternatives and the No Action Alternative were then evaluated using the NEPA process, as described in chapter V. A preferred alternative, the San Juan River Public Service Company of New Mexico (SJRPNM) Alternative (year 2040) was identified as ranking the highest among the nine factors (four accounts) and was the least environmentally impacting.

For the planning report requirements of this document, alternative plans for meeting the identified needs in the proposed project area had to meet a number of general criteria and standards, including those that encompass water quality, hazardous material concerns, endangered species preservation, and others.

PLAN FORMULATION PROCESS

The formulation of alternatives began with an evaluation of existing needs and solutions:

- Because of continued over-drafting of the groundwater table and limited surface water resources in the area, planning for the proposed project has been limited to surface water supplies from the San Juan River.

¹ A guide component in the formulation and subsequent evaluation of alternatives is the *Principles and Guidelines*, Water Resources Council, March 10, 1983.

² Another six structural year 2020 capacity alternatives were included early in the planning process for comparison purposes, but they were not retained for further analysis because by the time of project completion, their capacity would have been exceeded.

- Nonstructural alternatives—water conservation, water reuse, conjunctive use of groundwater, and aquifer storage—could not replace the proposed project. Rates of water use are already very low, and reuse is likely to be implemented with or without the proposed project to further reduce reliance on groundwater. Conjunctive use is planned to be an adjunct to project operation in the future.
- Plan formulation was influenced by public scoping meetings, informal public contacts, coordination with other entities, and interagency consultations. Specifically, the Bureau of Reclamation (Reclamation) worked closely with the Navajo and Jicarilla Apache Nations and the city of Gallup throughout the planning process.
- A project steering committee to guide the proposed project’s development has been in existence since the early 1990s. It is made up of representatives from the Navajo and Jicarilla Apache Nations, city of Gallup, State of New Mexico, Northwest New Mexico Council of Governments, Navajo Tribal Utility Authority (NTUA), Indian Health Service, Bureau of Indian Affairs, and Reclamation. The committee provided guidance throughout the planning process through technical experts representing the entities. The plan formulation process for this project spans nearly 30 years and is described in detail in volume II, appendix A.
- The laws and mandates listed at the end of chapter I were taken into account, as well as agency guidelines and procedures.

THE NO ACTION ALTERNATIVE

As required by NEPA, a No Action Alternative was formulated to provide the basis against which impacts of the action alternatives could be evaluated (chapter V). The No Action Alternative projects reasonably foreseeable future conditions without implementation of the proposed plan. Under the No Action Alternative, it is assumed that the action alternatives’ municipal and industrial (M&I) water supplies and delivery systems would not be constructed on the eastern side of the Navajo Nation, for the city of Gallup, or for the southwestern area of the Jicarilla Apache Nation.

The No Action Alternative assumes that water development in the San Juan River (Basin) would continue for projects with completed Endangered Species Act (ESA) section 7 compliance. It is also assumed that Navajo Dam and Reservoir will be operated to implement ESA-related Flow Recommendations to assist in conserving endangered fish in the San Juan River and to enable Basin water development (for more detail, see chapter I, “Other Projects and Actions in the San Juan River Basin,” and chapter V, “Connected, Cumulative, and Related Actions”).

The No Action Alternative would not limit the Upper Basin States' right to develop and use their compact apportionment. Apportionment planned for use in the proposed project may be available for other projects within the Basin. However, by failing to implement the Navajo Settlement Agreement and forcing the Nation to reinitiate its claims, local water users could potentially be adversely affected. Public Law 111-11 provides nullification of a settlement if the proposed project is not completed by December 31, 2024. Public Law 111-11 also includes deadlines for other components of the settlement. Failure to implement the settlement would continue the uncertainty of water rights within the Basin.

Under the No Action Alternative, the benefits of the proposed project would probably not be realized. Water shortages would be expected to intensify, reaching 1 million gallons per day (MGD) in the city of Gallup during peak periods as early as 2010 and continuing to worsen, with comparable shortages elsewhere in the proposed project area.

Water conservation and water reuse would not make up the shortfall, and new groundwater sources would not provide a full supply. The groundwater table would be further depleted. The economic development represented by the Navajo Agricultural Products Industry and the potential infrastructure in the Jicarilla Apache and Navajo Nations would be adversely affected by the absence of an adequate and reliable water supply. This deficiency would, in turn, contribute to continuing high poverty rates, high unemployment, and increasing outmigration from reservation lands.

NONSTRUCTURAL ALTERNATIVES

These alternatives approached the proposed project purpose by reducing the need for water through water conservation and water reuse.

Water Conservation

Water conservation is accomplished through public education, economic incentives, and regulatory tools. The city of Gallup currently has a water use ranging from 150 to 164 gallons per capita per day (gpcd), one of the lowest water use rates of communities in the Southwest. It has instituted a public education program and a tiered water rate structure to deter excessive water use. This approach to water use must continue into the future with or without this project for the city to have adequate water in the future. While conservation measures may help meet short-term needs, conservation is not a viable solution to meet long-term needs, and water conservation will not address the problem of declining water quality (increased salinity).

Throughout the proposed project area of the Navajo Nation, water use is approximately 110 gpcd where piped water is available and 10 to 20 gpcd where water is hauled. These are extremely low water use rates that would be difficult to reduce. The Jicarilla Apache

Nation plans to develop the area around Teepee Junction from a crossroads to a permanent residential and commercial area. Because there is currently no appreciable water use there, water conservation is not applicable. As a nonstructural alternative, water conservation did not meet the proposed project purpose and need and is considered incomplete and ineffective.

Water Reuse

Although current Safe Drinking Water Act regulations limit water reuse applications, water reuse can significantly increase a community's usable water supply. Under certain circumstances, reclaimed water can be used on outdoor landscaping and athletic facilities. The city of Gallup has implemented several innovative water reuse projects to irrigate its golf course and athletic fields. On the Navajo Nation, irrigated landscaping is very limited and most waste water ends up in individual septic systems or evaporation ponds. The Navajo Nation and Reclamation have contracted with Westlands Resources to investigate water reuse opportunities, and appraisal-level studies have been conducted in Tuba City and Ganado. The National Park Service has received a grant from the Arizona Water Protection Fund to use NTUA effluent in Ganado for a riparian restoration project.

Out of necessity, within the next couple of decades, water reuse systems will become commonplace. At the current time, there are no direct municipal effluent-to-drinking water systems in use in Arizona or New Mexico. The city of Gallup is considering treating its waste water for direct reuse. Assuming 60 to 70 percent of the waste water can be reused, this is only a short-term (10- to 15-year) relief from needing a perpetual long-term water supply. This does not meet the proposed project's intended goals and is therefore not a complete alternative. It is assumed that waste water reuse will continue to be part of the city of Gallup's long-term water management methods with or without the proposed project.

STRUCTURAL ALTERNATIVES

Introduction

Six structural alternatives were identified at two design capacities (2020 and 2040), which were analyzed in greater detail in volume II, appendix B. The proposed project's purpose is to meet the 2040 water demand, but 2020 design capacities were considered for comparison purposes. The six alternatives are:

- Navajo Indian Irrigation Project (NIIP) Moncisco
- NIIP Coury Lateral (also referred to as NIIP Coury)
- NIIP Cutter Lateral (also referred to as NIIP Cutter)

- NIIP Amarillo
- SJRPNM
- San Juan River Infiltration

All of the alternatives have one or more surface water diversion points. The four NIIP alternatives would divert water entirely from the NIIP system originating at Navajo Reservoir. The differences among the NIIP alternatives center on the points at which the water would be diverted before entering the proposed project pipeline system. For the two San Juan River alternatives, one of the options for diverting water from the San Juan River would be to construct a new turnout structure just upstream from the existing Public Service Company of New Mexico (PNM) diversion structure. Another San Juan River alternative diversion option includes a proposed Infiltration Gallery System (IGS) that would obtain water from the San Juan River downstream from the Hogback (see figure IV-6) and upstream of its confluence with the Chaco River. This diversion option would tie into the previously proposed alignment for the SJRPNM Alternative at the most feasible point.

In all of the alternatives, surface water would be treated to meet applicable drinking water standards for the proposed project area before entering the proposed project conveyance system. All of the proposed alternatives would include the same Gallup Regional System and be fully automated systems.

Basic Design Considerations

Water supply for the alternatives would originate directly from the San Juan River below Navajo Dam and/or from Navajo Reservoir through the NIIP facilities. Various river diversion points were considered, and the use of existing facilities to reduce impacts and costs was considered a priority in locating points to evaluate for diversion. The PNM diversion was considered the most logical to investigate because a fish passage exists at that point to help control impacts to fish and access to utilities and land for facilities is readily available at this point. Just downstream from the PNM diversion, prior investigation on an under-river drainage diversion had been done that led to evaluation of another diversion alternative. Consideration was also given to use of the existing NIIP facilities to transport project water, where possible, to capitalize on existing structures and reduce impacts and costs of new facilities.

Two facility sizes were evaluated based on providing a future water supply to 2020 and 2040. The year 2020 was selected as the minimum time horizon a future water supply should be considered, and 2040 demand was considered to be the most realistic projection of water need. The proposed project's purpose is to meet the 2040 water demand, and 2020 design capacities were shown for comparison purposes in the alternative comparison process but were not considered viable alternatives.

Conjunctive Use of Groundwater and Aquifer Storage

It is planned that groundwater would be used conjunctively with the proposed project water supply to enhance the overall water supply available to the city of Gallup and the Navajo Nation. Two approaches for conjunctive use have been considered: (1) utilizing wells during the summer when the water demand is at its peak and (2) using aquifer storage and recovery. These approaches are described in greater detail in the following sections.

Utilize Wells for Peak Summer Demand.—During the first few years of project operation, the proposed project would have adequate capacity to greatly reduce groundwater withdrawals. Eventually, however, the city of Gallup and NTUA would need to utilize their wells for short periods during the summer when the water demand is at its peak. By the year 2040, it is projected that the city’s system will need to produce approximately 1,400 acre-feet of groundwater, primarily during the summer months. The aquifers will be able to recharge during the remainder of the year.

Although the city of Gallup’s well fields may be able to supplement the total projected peak demands for a short period of time, it is unlikely that they will be able to replace the total projected summer demand. The estimated recharge to the source aquifers is very low, far less than current withdrawals. During the early life of the proposed project, it would greatly reduce or eliminate the city’s dependence on groundwater; however, by the year 2040, groundwater would be needed to help meet the summer peak demands.

Aquifer Storage and Recovery.—According to a technical review of aquifer storage (Shomaker, Inc., 1991), it may be possible to store and recover project water. Eventually, it may also be economically possible to store and recover treated waste water. Conceptually, production wells in the Ya-ta-hey and Santa Fe Well Fields would be used as injection wells during periods when water was available in excess of the city of Gallup’s demand. This water would then be available during periods when surface water was not available in adequate amounts. During the first years of the proposed project, the city might only be able to utilize approximately 4,500 acre-feet per year (AFY) out of the total project allocation of 7,500 acre-feet, and the difference might be available for recharge. Typically, the storage and recovery cycle is seasonal. With a seasonal cycle, the stored water does not have enough time to move far from the recovery well, and the groundwater head does not have enough time to dissipate to pre-storage levels before the water is recovered.

The source aquifers for the city of Gallup are confined, and they have very low hydraulic conductivities and storage coefficients (Shomaker, Inc., 1991). Because of the low

conductivity, groundwater movement is relatively slow. For these reasons, the injected water would stay within reach of a recovery well for a longer than typical period, and the rise in water levels would take a long time to dissipate. Therefore, a longer recovery period might be feasible. Injecting project water could restore part of the large decline in water levels in the wells and extend the life of the fields beyond the limits predicted by the city. The cost of storing this water would be partly offset by a reduction in the pumping lifts. Water levels are so deep that water may be injected successfully by gravity flow, requiring no pumping; aquifer storage is especially sensitive to the quality and chemical characteristics of the water (Shomaker, Inc., 1991). It is concluded that the concept is worth considering, but a complex analysis is needed before the feasibility of the concept can be determined.

All structural alternatives would rely on available groundwater in addition to the proposed project's surface water. Aquifer storage may help the city of Gallup and the Navajo Nation manage its water more efficiently if proven feasible.

Delivery Data

Delivery data for water demand in 2020 and 2040 were based on estimated population and demand for each of the six alternatives for each community each year. At the delivery points, the proposed project would connect to existing public water systems.

Based on expected populations in the year 2040, the proposed project would serve approximately 203,000 people in 43 chapters in the Navajo Nation, 1,300 people in the Jicarilla Apache Nation, and approximately 47,000 people in the city of Gallup. Peak daily demand was computed by multiplying the surface diversion for this project by a 1.3 peaking factor. The peaking factor was derived from a 7-day average in mid-July. The proposed project would connect to approximately 31 existing Navajo municipal systems and would provide a pressure of 70 pounds per square inch (psi) at those locations. The pressure requirement will vary with individual turnout. Storage capacity was based on the individual service area 5-day demand for the year 2020 for those communities with existing water distribution systems.

The city of Gallup and Jicarilla Apache Nation surface diversion requirements are 7,500 and 1,200 AFY, respectively, for all years in the proposed project. An independent analysis conducted by the city of Gallup identifies the system requirements for the city and the surrounding Navajo communities served by the city's system. No storage is included for the Jicarilla Apache Nation.

Commonalities of the Structural Alternatives

The structural alternatives for this project have similar design considerations, but the components vary for each alternative. All of the structural alternatives would have one or more surface water diversion points. The two San Juan River alternatives would divert water from both the San Juan River and from Cutter Reservoir. Cutter Reservoir is an existing feature of the NIIP system, which receives water from Navajo Reservoir.

The four NIIP alternatives would divert water entirely from the NIIP system originating at Navajo Reservoir. The differences between the NIIP alternatives center on the points at which the water would be diverted before entering the proposed project pipeline system. The NIIP Moncisco Alternative would convey water through the NIIP system and would store water in the proposed Moncisco Reservoir. The NIIP Coury Lateral Alternative would require construction of a smaller storage facility near the existing Coury Lateral. The NIIP Cutter Alternative would divert water from Cutter Reservoir. The NIIP Amarillo Alternative would convey water through the NIIP system and would require construction of a storage facility near the end of the Amarillo Canal, but also would divert water from Cutter Reservoir. The NIIP Coury Lateral, NIIP Cutter, and NIIP Amarillo Alternatives would require modification to NIIP facilities for winter use.

In all of the structural alternatives, surface water would be treated to meet primary Safe Drinking Water Act standards before entering the proposed project conveyance system. Treatment plant designs are based on the quality of the water at the point of diversion. Treated water would then be conveyed in pipelines toward points of use. When necessary, relift pumping plants would be included to keep the water flowing in the pipeline. Navajo communities that have an existing water distribution system would have a storage tank and a method to increase (by means of a turnout pumping plant) the pressure for proper distribution. Delivery locations in the transmission line that do not have an existing water distribution system would be provided with a tee and a blind flange for future use.

A typical relift pumping plant has a forebay tank, pumps and motors within an enclosed building, an air chamber, and rechlorination equipment. The forebay tank provides an adequate supply of water to minimize the number of times the pumps cycle on and off. The air chamber provides protection of the pumping plant and pipeline when the pumps are started and stopped. Rechlorination equipment provides the required chlorine residual in the treated water.

The turnout pumping plants would have the same components as the relift pumping plants except that a storage tank would replace the forebay tank. Rechlorination equipment might not be necessary if chlorine residuals were adequate. A summary of the major components required for each of the alternatives is shown in table IV-1.

Table IV-1.—General summary of components

Component	NIIP Moncisco Alternative	NIIP Coury Lateral Alternative	NIIP Cutter Alternative	NIIP Amarillo Alternative	SJRPNM Alternative	San Juan River Infiltration Alternative
River intake					1	
Infiltration wells						26
River pumping plant					1	
Treatment plants	1	1	1	2	2	2
Forebay tanks	12	8	11	17	19	20
Pumping plants	12	8	11	17	20	20
Regulating tanks	5	5	5	6	5	5
Community storage tanks	20	20	20	20	20	20
Feet of pipeline	1,361,954	1,389,378	1,466,248	1,286,082	1,237,792	1,189,145
Miles of pipeline	258	263	278	244	234	225

Project facilities serving the Gallup area are collectively called the Gallup Regional System, and they are common to all alternatives. They consist of one new pumping plant, upgrades to three storage tanks, and 32 miles of pipeline, as shown in table IV-2. None of the alternatives’ facilities physically connect with the Animas-La Plata Project’s Navajo Nation Municipal Pipeline.

Table IV-2.—Gallup Regional System

Component	NIIP Moncisco Alternative	NIIP Coury Lateral Alternative	NIIP Cutter Alternative	NIIP Amarillo Alternative	SJRPNM Alternative	San Juan River Infiltration Alternative
Pumping plants	4	4	4	4	4	4
Community storage tanks	5	5	5	5	5	5
Feet of pipeline	171,923	171,923	171,923	171,923	171,923	171,923
Miles of pipeline	32.6	32.6	32.6	32.6	32.6	32.6

Surface Water Diversions

NIIP Alternatives

Cutter Reservoir.—For the NIIP Cutter Alternative only, existing Cutter Reservoir would supply all of the water for the entire project, and there would be no diversion from the San Juan River.

Moncisco Dam and Reservoir.—Moncisco Dam and Reservoir would be constructed specifically for the proposed project. Water would be delivered to Moncisco Reservoir from the existing Burnham Lateral, part of the NIIP. The designs for Moncisco Dam would include a river outlet works with a tee for diverting water into the water treatment plant.

The Moncisco Water Treatment Plant would deliver treated water to a pumping plant, which would then pump water into the proposed Cutter and San Juan Laterals for transmission to the various communities.

Coury Lateral.—A canal turnout structure would be constructed near the beginning of Coury Lateral for the NIIP Coury Lateral Alternative. Water from the Coury Lateral would be diverted into a 4,500 acre-foot storage pond and, from that point, would be pumped into a treatment plant.

Amarillo Canal.—A canal turnout structure would be constructed near the end of the Amarillo Canal for the NIIP Amarillo Alternative. Water from the Amarillo Canal would be diverted into a 4,500 acre-foot storage pond and, from that point, would be pumped into a treatment plant.

San Juan River Alternatives

PNM Diversion Structure.—For the San Juan River alternatives, one of the options for diverting water from the San Juan River is to construct a new turnout structure just upstream from the existing PNM diversion structure, which is located about 1.5 miles northwest of Fruitland, New Mexico. The PNM diversion conveys water for a coal-fired steam electric plant.³ The use of the existing PNM facilities was evaluated, but because of the potential impact on PNM's water quality, it was determined that a study should

³ A report was prepared for Reclamation by Tetra-Tech Inc. In this report, Tetra-Tech developed a simple HECRAS model of the PNM diversion and settling channel describing the hydraulics and theoretical settling characteristics of sediment in the PNM intake channel.

proceed with the concept of constructing a water intake structure independent of the existing PNM intake facility and to include independent sediment removal facilities. It was assumed that the new concrete structure would be located just upstream from the existing intake/turnout on the north side of the San Juan River.

The structure would have a side intake with a trash rack and fish screen. The flow was assumed to be 0.5 foot per second through the trash rack. There would be a ramp at a 10:1 slope down which equipment would be driven to the pumping plant sump from which silt buildup would be removed. A pump would also be provided to remove sediment from the sump. The pumping plant would have a maximum capacity of 60 cubic feet per second (cfs). Each of the vertical turbine pumps would be rated at 100 horsepower. At the top of the ramp would be a 24-foot square parking/loading area. The entire site would be fenced with a 7-foot-high chain link fence. The pumping units would pump from the sump to settling basins and the treatment plant.

Infiltration Gallery System.—The San Juan River Infiltration Alternative includes an IGS that would obtain water from the San Juan River downstream of the Hogback and upstream of its confluence with the Chaco River. This diversion option would tie into the previously proposed alignment for the SJRPNM Alternative at the most feasible point. The proposed IGS components would include a series of infiltration galleries placed in the river alluvium, collection wells and pumps, a collection manifold system and tank, a pumping plant, and a pipeline to the proposed water treatment plant site.⁴ The gallery caissons were spaced approximately 500 feet apart along the San Juan River and were at locations influenced by environmental considerations. For this study, the yield of each well was estimated at 1.5 MGD (2.33 cfs).

A typical collector well is constructed of a concrete caisson typically ranging from 12 to 20 feet in diameter and approximately 20 feet deep. Each collector well would include a pump and a backup pump housed in a weatherproof enclosure. Numerous infiltration pipes would radiate out from the caisson into the river alluvium. The infiltration pipe would be perforated to allow water filtering through the alluvium to enter the pipe and be transported to the collector well, from which it would then be pumped. The well pumps would convey water through a collection manifold that would gather the water from the entire infiltration gallery (well field) to a collection sump and pumping plant. The pumping plant would lift the water approximately 120 feet in elevation from the river elevation to the bluffs south of the San Juan River into the water treatment plant.

⁴ The location and cost estimate for the collection wells were prepared by Ranney, a company that specializes in the design and construction of infiltration gallery systems.

Cutter Dam and Reservoir (Existing Features of the NIIP).—The Cutter Lateral is part of the San Juan River alternatives and would serve communities in the eastern portion of the Navajo Nation and the Jicarilla Apache Nation. The Cutter Lateral would obtain water from Cutter Reservoir via the river outlet works. Cutter Dam and Reservoir are existing features of the NIIP. The Cutter water treatment plant would deliver treated water to a pumping plant, which would then pump the water into Cutter Lateral for transmission to the various communities.

Description of the Alternatives

NIIP Moncisco Alternative

The NIIP Moncisco Alternative would utilize two laterals to deliver water to different portions of the Navajo Nation, but both would begin at one location, the proposed Moncisco Reservoir (figure IV-1). This alternative would use existing NIIP canals and features to convey water to the proposed Moncisco Reservoir during the irrigation season. From the proposed water treatment plant near Moncisco Reservoir, the East Lateral would convey water south to communities in the eastern portion of the Navajo Nation and the Jicarilla Apache Nation. The West Lateral would convey water south to communities in Navajo chapters along Highway 491 in the eastern portion of the Navajo Nation and to the city of Gallup. Several sublaterals would convey water to the communities of Window Rock, Arizona, and the Nahodishgish Chapter/Dalton Pass, New Mexico.

Water for the NIIP Moncisco Alternative would be conveyed from the existing Burnham Lateral to the proposed Moncisco Reservoir via a proposed stabilized channel. The NIIP system would convey water from Navajo Reservoir and through a series of canals, siphons, and tunnels to the Gallegos Pumping Plant, which conveys water to Burnham Lateral. An existing wasteway in Burnham Lateral would be used with the proposed stabilized channel to convey water to Moncisco Reservoir. Moncisco Dam and Reservoir would be constructed specifically for the proposed project and would have an approximate capacity of 12,000 acre-feet of active storage. This storage would be provided because the NIIP system would not operate during the winter months. Previous designs, estimates, and quantities from two Reclamation reports⁵ were evaluated and refined, and the costs for these designs were indexed for this study.

A water treatment plant would be located immediately downstream of Moncisco Dam and Reservoir to treat the water before it is conveyed to the Navajo communities, the Jicarilla Apache Nation, and the city of Gallup. The treatment plant would utilize an

⁵ Technical Memorandum No. GG-8311-2, “Gallegos Dam, Reconnaissance Design Summary” and *Water Supply and Storage Options, Gallup Navajo Pipeline Project, Engineering and Cost Estimates Appraisal Level Report*.

enhanced coagulation and hollow fiber ultrafiltration treatment system. Treated water would be pumped into the West and East Laterals. The NIIP Moncisco Alternative would have an expected flow capacity requirement of 67.52 cfs (43.6 MGD).

NIIP Cutter Alternative

The NIIP Cutter Alternative would be similar to the NIIP Moncisco Alternative, but would not require the construction of Moncisco Dam and Reservoir (figure IV-2). Water would be released from Navajo Reservoir and conveyed through the existing NIIP system to Cutter Reservoir throughout the year, requiring improvements for winter use of a portion of the existing NIIP facilities. The treatment plant would be constructed at the base of Cutter Dam. Water would be pumped from the base of Cutter Dam through the Cutter Lateral to Highway 550, at which point the pipeline would serve the East and West Laterals following the same alignments as the NIIP Moncisco Alternative.

NIIP Coury Lateral Alternative

The NIIP Coury Lateral Alternative is similar to the NIIP Moncisco Alternative, but instead of constructing Moncisco Dam and Reservoir, the existing NIIP facilities would be winterized to convey project water throughout the year (figure IV-3). A turnout structure would divert water from the Coury Lateral and tie into the alignment proposed in the NIIP Moncisco Alternative. The turnout structure was sized based upon a standard canal turnout with a 48-inch-diameter outlet pipe. This alternative requires a 4,500-acre-foot lined storage pond located near the Coury Lateral, which would provide storage capacity for the summer months when NIIP facilities could not provide both peak irrigation demand and project demands (volume II, appendix B). The pond was assumed to be square, with a 20-foot water depth and 3 feet of freeboard. The pond was partially excavated below original ground, and a compacted embankment was assumed to be 5 feet above original ground and 6 feet wide at the top. The interior was assumed to be lined with a 40 mil membrane liner and 6 inches of riprap.

The water treatment plant, as described in the NIIP Moncisco Alternative, would be located near the storage pond and the Coury Lateral, and flows would be the same as those discussed under that alternative.

All flows for the proposed project remain the same, as described in the NIIP Moncisco Alternative.

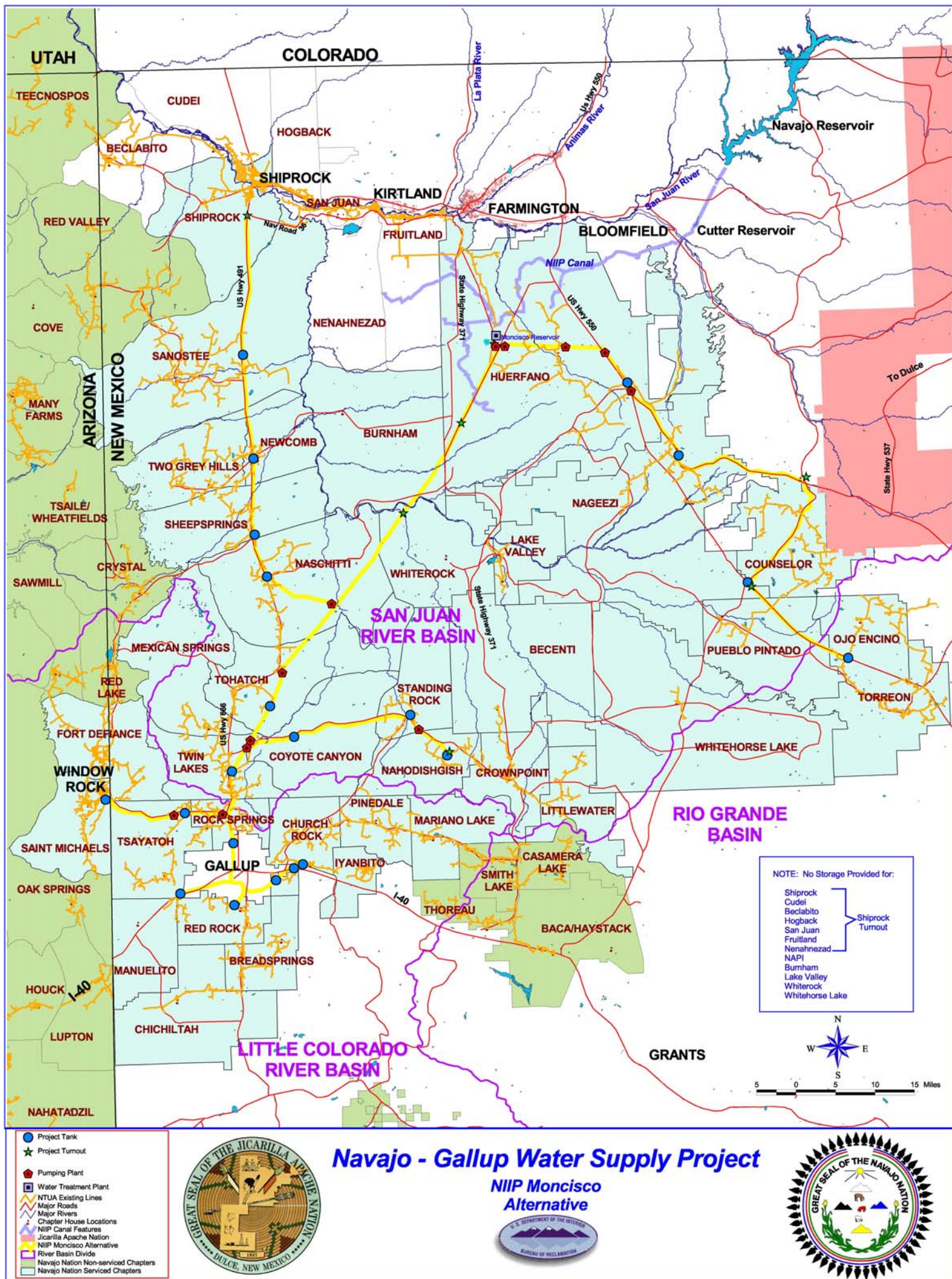


Figure IV-1.—NIIIP Moncisco Alternative.

USBR Drawing No. 1695-406-46

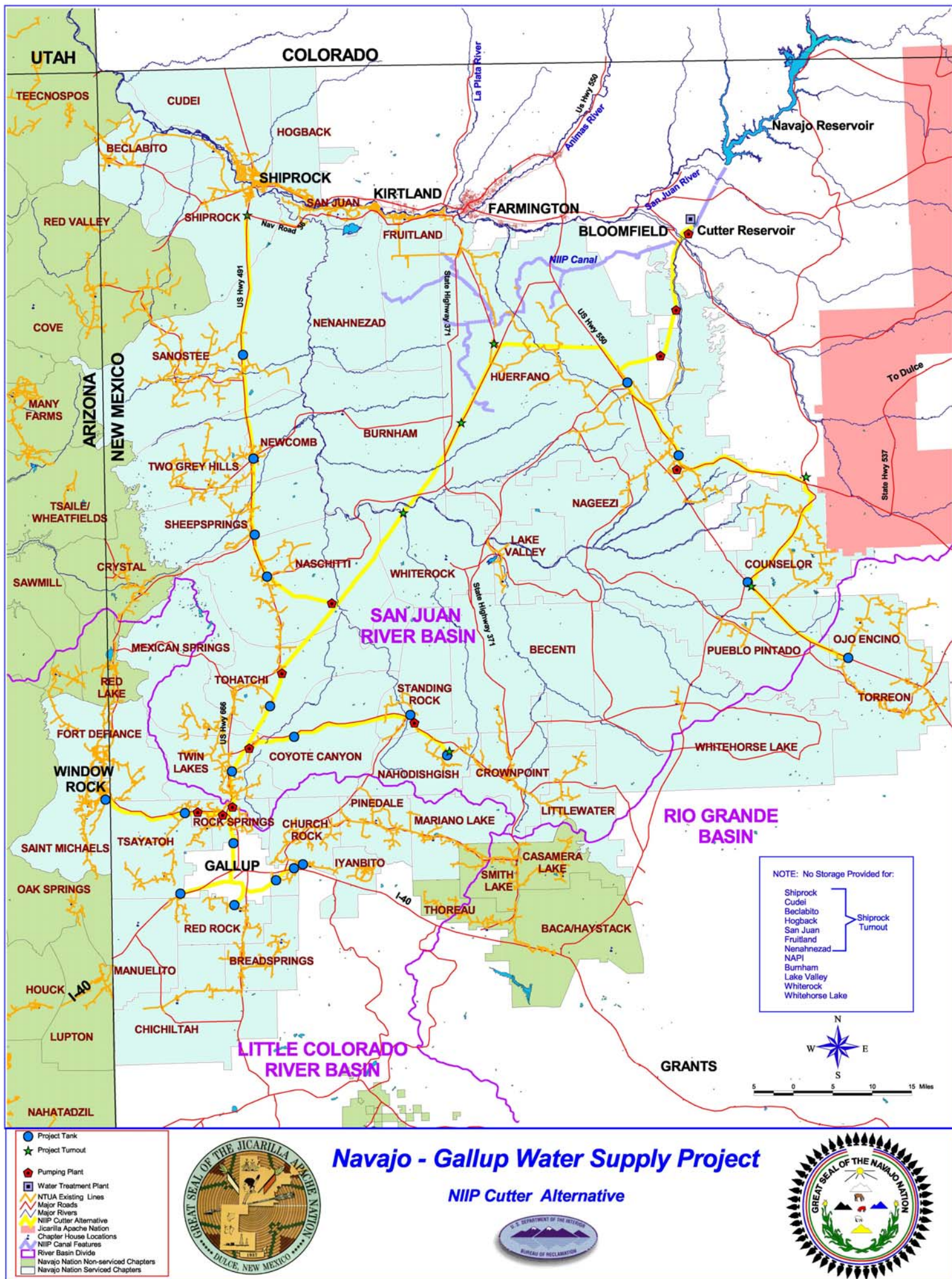
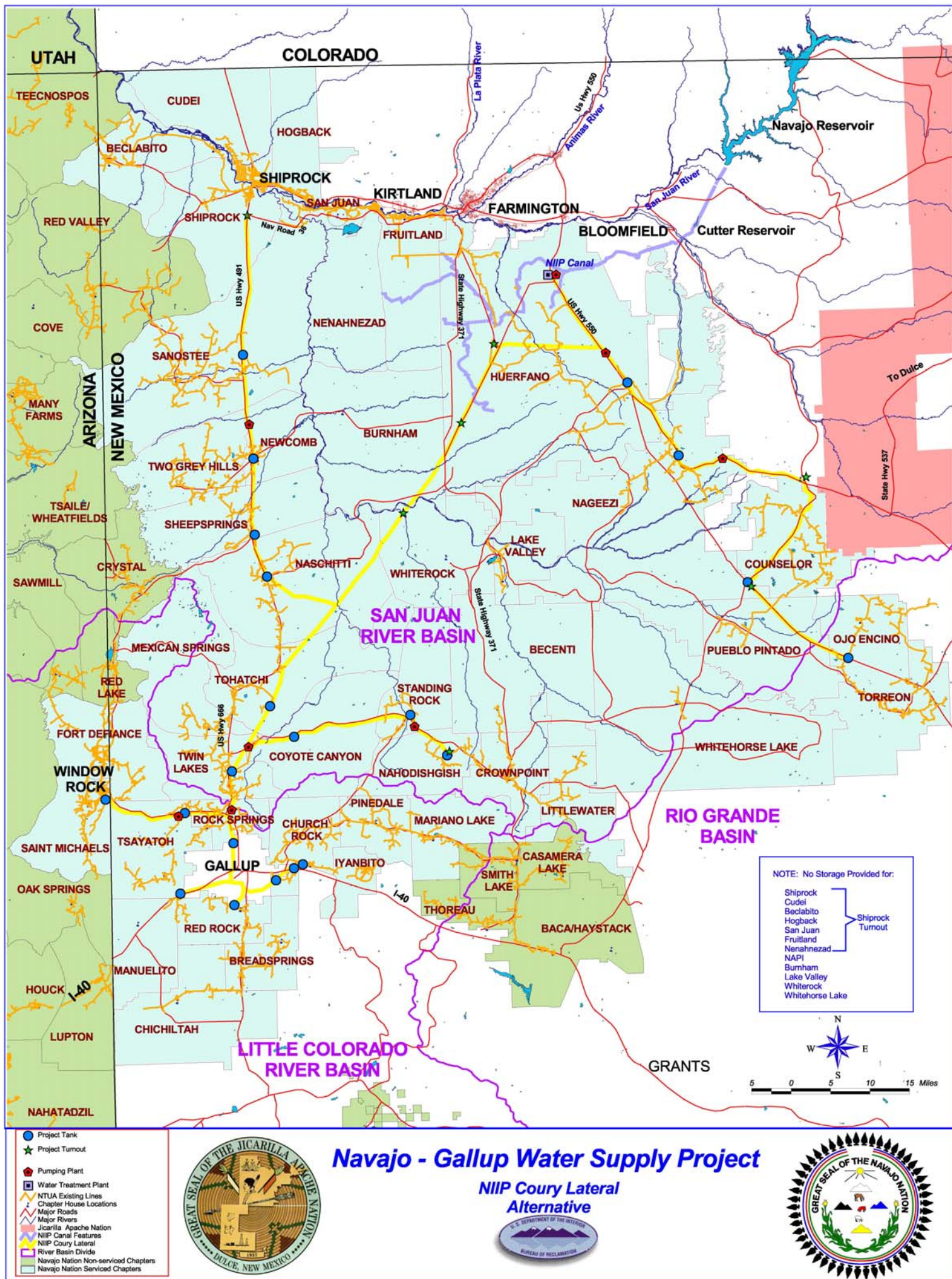


Figure IV-2.—NIIIP Cutter Alternative.



USBR Drawing No. 1695-405-44

Figure IV-3.—NIIP Courty Lateral Alternative.

NIIP Amarillo Alternative

The NIIP Amarillo Alternative is similar to the NIIP Coury Lateral Alternative in that the existing NIIP facilities would be improved for winter use to convey project water throughout the year (figure IV-4). However, this alternative diverts water from the end of the Amarillo Canal for one lateral, as well as from Cutter Reservoir for the Cutter Lateral. A turnout structure would divert water from the Amarillo Canal and tie into the alignment proposed for the SJRPNM Alternative (see below). The turnout structure was sized based upon a standard canal turnout with a 48-inch-diameter outlet pipe. This alternative requires a 4,500 acre-foot lined storage pond located near the canal.

A water treatment plant would treat the water from the Amarillo Canal before the water was transmitted to the Navajo communities and the city of Gallup. Another treatment plant immediately downstream of Cutter Dam would provide treated water to the eastern portion of the Navajo and Jicarilla Apache Nations. Both treatment plants would utilize an enhanced coagulation and hollow fiber ultrafiltration treatment system. Flows would be divided between the Amarillo Canal and Cutter Reservoir.

SJRPNM Alternative

The SJRPNM Alternative is made up of two separate lateral systems—the San Juan Lateral and the Cutter Lateral (figure IV-5). The San Juan Lateral would divert water from the San Juan River downstream of Fruitland, New Mexico, and treat and deliver the water west along Highway N36 and south along Route 491 (formerly Route 666) to communities in the eastern portion of the Navajo Nation in New Mexico and the city of Gallup. This lateral utilizes several sublaterals to serve such communities as Window Rock, Arizona, and the Nahodishgish Chapter/Dalton Pass, New Mexico. As noted, the SJRPNM Alternative would divert water from the San Juan River just upstream from the existing PNM diversion structure. A side channel inlet structure would be designed with a sump, and water would then be pumped to settling basins and a treatment plant. The Cutter Lateral would obtain water from the NIIP system at the existing Cutter Reservoir and treat and deliver the water south to communities in the eastern portion of the Navajo Nation and the Jicarilla Apache Nation.

A water treatment plant would treat the water from the San Juan River before the water was transmitted to the Navajo communities and the city of Gallup. Another treatment plant immediately downstream of Cutter Dam would provide treated water to the eastern portion of the Navajo and Jicarilla Apache Nations. Both treatment plants would utilize an enhanced coagulation and hollow fiber ultrafiltration treatment system.

San Juan River Infiltration Alternative

The San Juan River Infiltration Alternative is the same as the SJRPNM Alternative, except that the water would be diverted from the San Juan River through an IGS just downstream from the Hogback irrigation diversion, an existing structure further downstream than the PNM diversion (figure IV-6). All other aspects would be the same as for the SJRPNM Alternative.

Overall Operational Configuration

Each of the proposed alternatives would be fully automated systems. The water treatment plants would operate automatically to maintain availability of treated water. The system downstream of the treatment plants would be a series of pumping plants, regulating or forebay tanks, and community storage tanks. Each pumping plant operation along the main water transmission line would be controlled by float level switches in the forebay or a regulating tank upstream from that plant. During periods of low water demand from a local community, water altitude valves in the community storage tanks would reduce flows into the storage tank at predetermined elevations by shutting down pumps as demand decreased. As demand increased, staged pumps (one pump for each increment of 10 cfs) would start. The pumping plants would not need to be attended on a full-time basis, but would require a daily physical inspection. Each pumping plant would have one backup pump and an emergency generator capable of meeting full load power requirements for that plant in the event of a power outage (Reclamation, 2002c).

Pumps.—The pumps at the pumping plants were assumed to be of equal size with a maximum capacity of 10 cfs each. There is one standby pump unit at each pumping plant. The majority of the pumps would be horizontal split-case type. Each pump would have a suction and discharge valve with an electric or hydraulic operator. The pumps in the relift pumping plants and the turnout deliveries all would require a minimum of 15 feet of head on the suction side. Pumps would be controlled by level switches that sense the water levels in the regulating, forebay, and storage tanks. There are also two pumps (one plus standby) rated at 2.32 cfs at each infiltration well (Infiltration Gallery) system.

Air Chambers.—A typical air chamber size would be a 20-foot-diameter sphere. It was assumed that this would be an average size air chamber, and this size was used at all locations where an air chamber was needed.

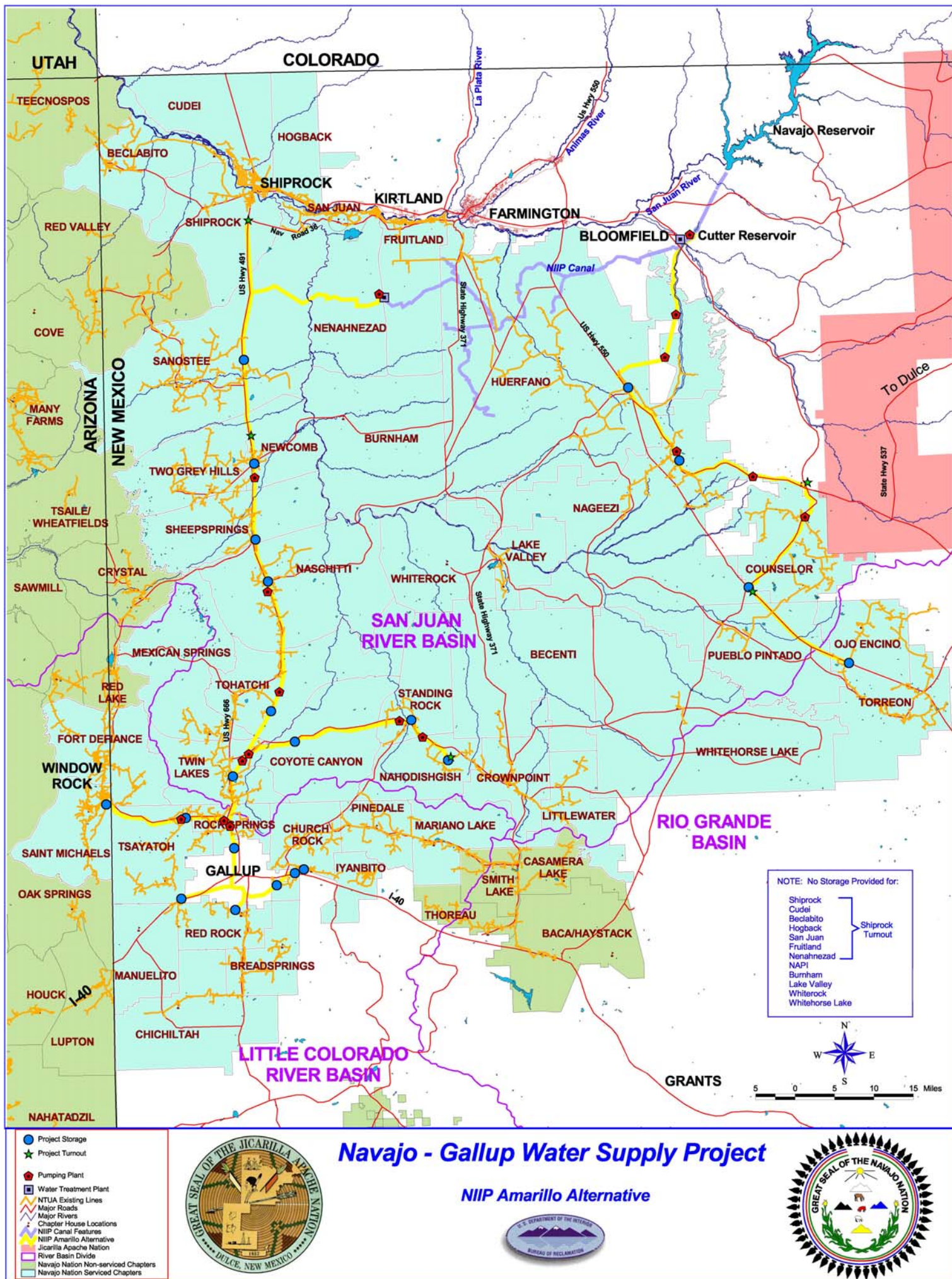


Figure IV-4.—NIIP Amarillo Alternative.

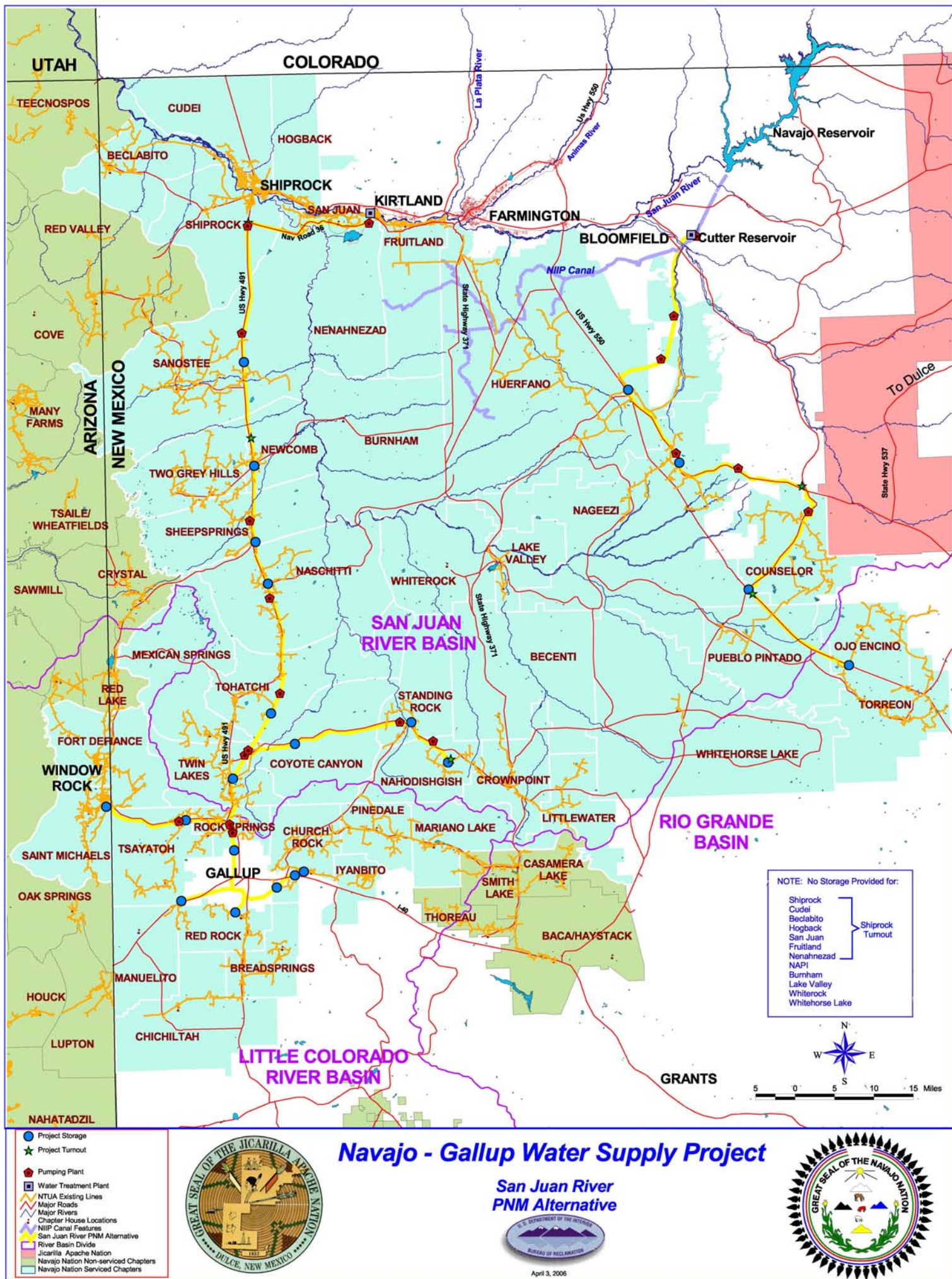


Figure IV-5.—SJRPNM Alternative.

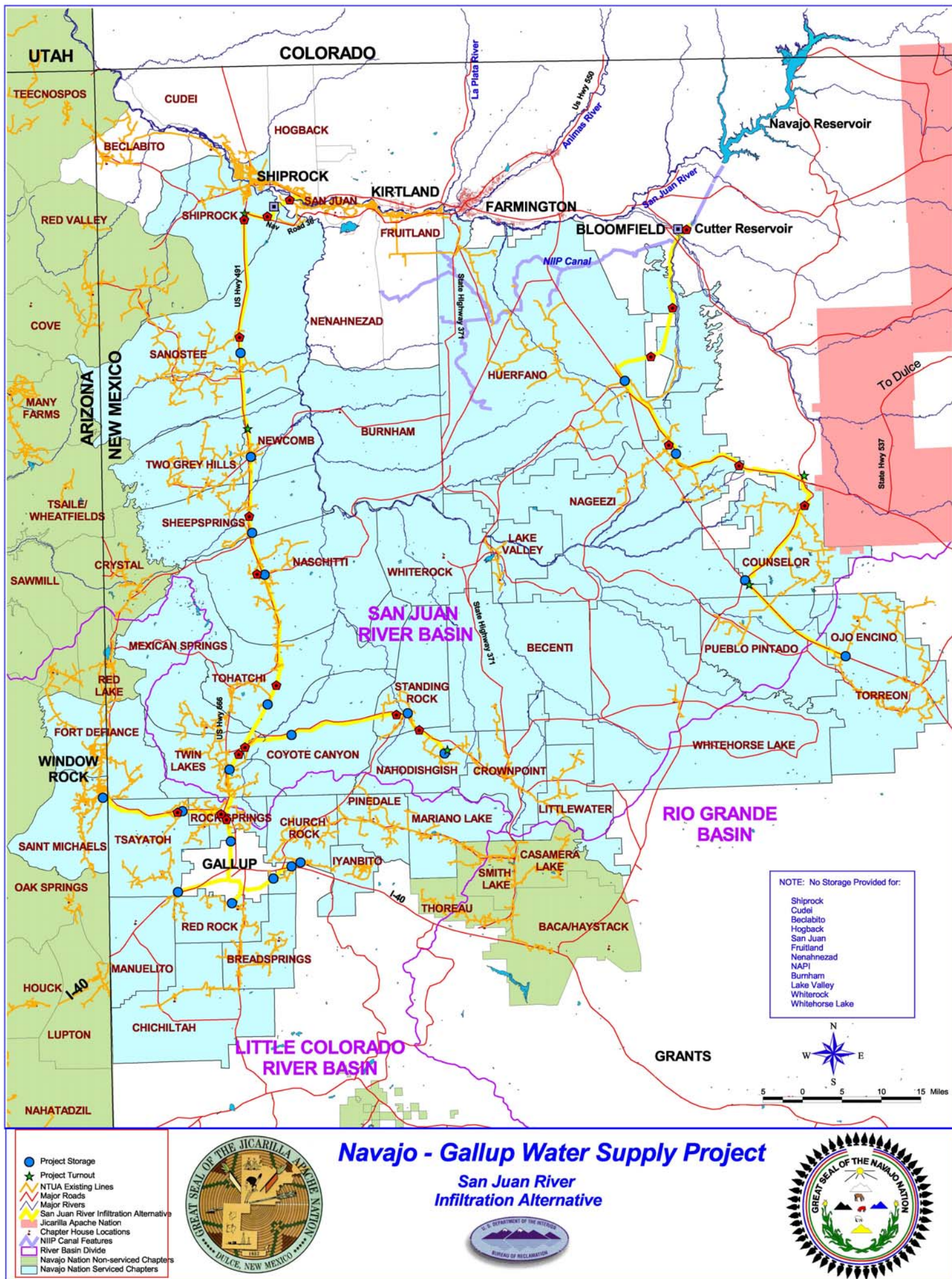


Figure IV-6.—San Juan River Infiltration Alternative.

Tanks.—Forebay tanks would be required upstream of almost every pumping plant to supply water during startup of the pumps and during shutdown to reduce damages. Altitude valves would be installed at most sites to prevent the forebay tanks from overflowing (volume II, appendix B). All of the forebay tanks were estimated to be 8 feet in diameter and 40 feet tall. In the next level of study, each of these tanks would be sized on an individual basis.

Where possible, regulating tanks were placed at high points, and gravity flow could then be used to deliver water to lower points in the system. By assuming that the pumps in the pumping plants would be 10 cfs or less and that the minimum run time was 15 minutes, the regulating tank diameters were found to be 40 feet. Then, depending on the number of pumps, the heights of the tanks were computed. Tank heights ranged from 9 to 22 feet. The height included 2 feet for bottom dead space and 5 feet for overflow and top freeboard space. Tank water surfaces would be the primary control for automatically stopping and starting the pumps. Storage tanks were provided at the delivery turnouts for the communities that had existing water distribution systems. These tanks store a 5-day water supply for the community, which is then boosted by the pumping plant to a pressure of 70 psi into the community water system. It was assumed that the height of the storage tanks would be 20 feet, and the diameters were computed based on the values for the 5-day storage for 2020 demands.

Electrical.—Several locations would be tapped to provide power for the pumping plants and miscellaneous equipment. The NTUA is installing a 115 kilovolt (kV) line (energized at 69 kV) from Tohatchi to Newcomb. This proposed powerline was assumed to be constructed by the time the proposed project began. The proposed project would extend this NTUA powerline along Route 491 north to Shiprock and south along the pipeline alignment to Window Rock and the Nahodishgish Chapter/Dalton Pass, New Mexico.

The pumping plants located in the eastern portion of the Navajo Nation would obtain power from an existing 230-kV powerline owned by PNM. There are two locations where this powerline could be tapped to provide power, depending on the alternative plan and the distance of new transmission line construction. The transmission line would include one overhead optical ground wire for T1 fiber optic communications. A small switchyard with at least one circuit breaker would be required to provide electrical protection for the downstream facilities.

The following are transmission lines and substations for each alternative:

SJRPNM Alternative	107 miles and 1 substation near Nageezi
San Juan River Infiltration Alternative	107 miles and 1 substation near Nageezi
NIIP Moncisco Alternative	73 miles and 1 substation near Moncisco
NIIP Coury Lateral Alternative	74 miles and 1 substation near Nageezi
NIIP Cutter Alternative	93 miles and 1 substation near Nageezi
NIIP Amarillo Alternative	107 miles and 1 substation near Nageezi

The substations would tap power from a 230-kV line owned by PNM and would convert to 69 kV. Kutz substation would be used to serve the pumping plant near the Coury Lateral of the NIIP Coury Lateral Alternative. Transmission line lengths may change due to pumping plant location changes.

Pipelines.—Design velocity would be about 5 feet per second or less and the maximum pump lift would be about 400 feet. The minimum system pressure along the pipe laterals was 15 feet. Pipe friction losses were limited to about 25 percent of the total dynamic head for the pumps. It was assumed that all of the lateral pipe would be mortar-lined steel pipe with full inside diameters.

OTHER ALTERNATIVE COST ATTRIBUTES

Land, Relocations, and Damages

Facilities of all alternatives are primarily located on Navajo Nation lands and public land with the exception of the water treatment plant for the SJRPNM Alternative. This plant and associated facilities would be located on private land, and purchase of land and relocation of existing families would be required, which is discussed in further detail in chapter V and attachment I. There is the possibility of crossing sections of private land and Tribal allotments with the pipeline, but specific pipeline locations have not yet been identified. It is assumed that a no-cost agreement can be made with private landowners and allottees or the pipeline would be realigned.

All land requirements and rights-of-way (ROW) required on Navajo Nation and public land are assumed to be at no cost except for identification, processing, and recording. Damages caused by construction of the proposed project would be paid to those impacted, as was estimated and included in the costs of all alternatives. Damages are based on the estimated number of families disrupted along the alignment of the alternative facilities and the proposed projected impact of facility construction, as discussed in further detail in attachment I. The estimated cost for each alternative is shown in table IV-4. The estimate includes ROW costs for the SJRPNM treatment plant only. Should it be determined that ROW for the rest of the features needs to be included in the proposed project costs, an additional \$30–60 million should be added.

All land rights would be acquired pursuant to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and the Uniform Relocation Act Amendments of 1987 (42 U.S.C. § 4601). It is the policy of Reclamation to compensate

for crop damages occasioned by nontortious⁶ activities of Reclamation during construction, operation, and maintenance under pipeline ROW or easements regardless of the method of acquisition.

Environmental Mitigation

Mitigation costs considered under all alternatives are determined by the impacts of construction and operating and maintaining the facilities. The mitigation is associated with land-disturbing activities and associated impacts to vegetation, wildlife, and other resources. Along the San Juan River, impacts to riparian areas are assumed to be mitigated with improvement in a ratio of 3 acres to every 1 acre impacted. Along the pipeline alignment and other facility locations, the improvement was assumed to occur in the disturbed area. Mitigation would be area-specific, but would generally consist of improved vegetation, fencing, and land management. Mitigation costs are directly related to the area that would be impacted by each alternative. The associated cost for each alternative is shown in attachment I and volume II, appendix B. Chapter IV further describes environmental commitments and mitigation measures.

Cultural Resources

The anticipated cost of mitigation of impacts to cultural resources is based on the cost of similar mitigation work on projects in the area—the Dolores and Animas-La Plata Projects. Four percent of the capital construction costs of each alternative is considered an appropriate relative cost to use in the evaluation of the alternatives. It should be noted that Public Law 111-11 limits this to 2 percent. A specific archaeological survey was completed on two project alternatives and was used to provide an impact analysis and cost estimate (Wharton and Cleveland, 2002). This information was used to define a specific mitigation plan used in the next step of defining the selected alternative.

SCREENING PROCESS

Eight alternatives were initially screened for meeting the *Principles and Guidelines*' four tests of viability, including the six structural alternatives at the 2020 design capacity. The result was that the six structural alternatives (2040 design capacity) were carried forward for a more detailed comparison for screening. The next level of screening, in part to meet *Principles and Guidelines*' four account requirements, included a comparison of the total

⁶ Nontortious actions do not involve civil actions for injury or damage.

costs of each alternative as measured by its present cost per-acre-foot value. The six action alternatives were then rated, weighted, scored, and ranked according to nine factors. More detail about the screening process is in attachment J.

The Principles and Guidelines

The Four Tests of Viability

The *Principles and Guidelines* describe four overarching tests of viability to be considered for each alternative. The tests assess the completeness, effectiveness, efficiency, and acceptability of the alternative plans. Alternatives that met a minimum standard under all four tests were considered viable plans and were investigated in greater detail.

Completeness – This factor measures the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective.

Effectiveness – This factor measures the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency – This factor measures the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities and is consistent with protecting the Nation’s environment.

Acceptability – This factor measures workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies.

Table IV-3 displays the results of applying the four tests of viability to the eight alternatives. The No Action and Water Conservation Alternatives did not meet the *Principles and Guidelines*’ four tests of viability; therefore, the Water Conservation Alternative was screened out and the No Action Alternative was retained solely to meet NEPA plan formulation requirements. Additionally, although the year 2020 design capacities for the six structural alternatives are not shown in table IV-3, they were found to be incomplete, ineffective, and unacceptable because they did not meet the proposed project’s objective of providing an M&I water supply to the year 2040.

Table IV-3.—Application of the viability tests

Alternative	Completeness	Effectiveness	Efficiency	Acceptability
No Action	No	No	No	No
Water Conservation	No	No	No	No
SJRPNM	Yes	Yes	Yes	Yes
San Juan River Infiltration	Yes	Yes	Yes	Yes
NIIP Moncisco	Yes	Yes	Yes	Yes
NIIP Coury Lateral	Yes	Yes	Yes	Yes
NIIP Cutter	Yes	Yes	Yes	Yes
NIIP Amarillo	Yes	Yes	Yes	Yes

The Four Accounts

The four accounts specified in the *Principles and Guidelines* are used to evaluate information on the effects of viable plans—NED, EQ, RED, and OSE accounts. Each account describes particular aspects of anticipated effects of the viable alternatives on the economy and environment.

The NED account measures changes in the economic value of the national output of goods and services, while the RED account gauges changes in the distribution of regional economic activity. The EQ account measures significant effects on natural and cultural resources, and the OSE account measures effects from perspectives that are relevant but not reflected in the other three accounts. The *Principles and Guidelines* require that the plan chosen must maximize net NED benefits as the preferred alternative, or else Reclamation must obtain an exception from the Secretary of the Interior to formulate a plan to meet other needs. The economic benefits of each alternative are essentially the same; therefore, the alternative with the smallest present worth value (also referred to as the total project cost measured in terms of cost per acre-foot of water) would represent the alternative that maximized NED benefits, and those results are discussed in the following section.

Comparative Total Costs of the Alternatives

The next step was to calculate the total project cost or present worth value (capital, construction, and operation, maintenance, and replacement [OM&R] costs) of the proposed project in order to satisfy requirements for the NED—the most critical of the four *Principles and Guidelines* accounts. The alternatives are ranked from highest to lowest cost, and the total estimated costs of the alternatives are reflected in table IV-4.⁷

⁷ The alternative costs and present value for the SJRPNM Alternative (preferred alternative) were not updated here for comparison purposes with the other alternatives. Updated costs for the preferred alternative are included in attachment I.

Table IV-4.—Present worth of alternatives (2001 \$)

	Alternatives					
	NIIP Moncisco	NIIP Coury	NIIP Cutter	NIIP Amarillo	SJRPNM	SJR Infiltration
Construction cost	570,000,000	550,000,000	620,000,000	470,000,000	440,000,000	470,000,000
Rank	2	3	1	4	6	4
Total project cost (construction, fish and wildlife, land, archaeology)	599,700,000	578,700,000	652,000,000	495,100,000	465,600,000	494,700,000
Rank	2	3	1	4	6	5
Total project cost (construction, fish and wildlife, land, archaeology) per acre-foot	15,881	15,325	17,266	13,111	12,330	13,100
Rank	2	3	1	4	6	5
OM&R costs NTUA	8,900,000	8,000,000	9,500,000	10,100,000	12,500,000	11,400,000
Rank	5	6	4	3	1	2
OM&R costs NTUA per acre-foot	236	212	252	267	331	302
Rank	5	6	4	3	1	2
OM&R costs CRSP	6,400,000	6,000,000	6,500,000	7,500,000	8,500,000	7,600,000
Rank	5	6	4	3	1	2
OM&R costs CRSP per acre-foot	169	159	172	199	225	201
Rank	5	6	4	3	1	2
Present worth total project NTUA	732,955,541	698,480,261	794,239,060	646,322,580	652,756,658	665,386,872
Rank	2	3	1	6	5	4
Present worth total project NTUA per acre-foot	19,409	18,496	21,032	17,115	17,286	17,620
Rank	2	3	1	6	5	4
Present worth total project CRSP	695,524,209	668,535,196	749,321,462	607,393,995	592,866,528	608,491,248
Rank	2	3	1	5	6	4
Present worth total project CRSP cost per acre-foot	18,418	17,703	19,843	16,084	15,700	16,113
Rank	2	3	1	5	6	4

Notes: Costs shown above are obtained from "Navajo-Gallup Water Supply Project, Appraisal-Level Design and Cost Estimates," Bureau of Reclamation, Technical Service Center, 2002c. Present worth costs include construction and OM&R costs for 50 years. The estimate includes ROW costs for the San Juan Treatment Plant only. Should it be determined that ROW for the rest of the features needs to be included in the project costs, an additional \$30–60 million should be added.

Costs used in this analysis are at the October 2001 price level.⁸ The present worth analysis is based on a 50-year alternative life and an interest rate of 6.37 percent. OM&R cost estimates are shown for both Colorado River Storage Project (CRSP) and NTUA power costs. Results of this comparative analysis show that the SJRPNM and NIIP Amarillo Alternatives have the lowest present worth. The SJRPNM Alternative is the lowest using CRSP power rates, and the NIIP Amarillo Alternative is the lowest using NTUA power rates. The economic benefits of all the 2040 alternatives are essentially equal for this project, and the present worth is considered reflective of the NED account.

Alternatives Comparison and Weighting

Nine factors were identified to compare the alternatives:

- (1) Capital cost per acre-foot delivered
- (2) OM&R cost per acre-foot delivered
- (3) Impacts to endangered species
- (4) Impacts to environmental resources (aquatic, wildlife, vegetation, land use, and recreation)
- (5) Impacts to cultural resources
- (6) The quality of drinking water provided
- (7) Social and economic impacts
- (8) Acceptability to project participants
- (9) Risks associated with construction, implementation, and OM&R

For factor definitions, please see attachment J.

⁸ October 2001 cost estimates were available when this analysis was done. Since this analysis, costs and present worth for the SJRPNM Alternative (preferred alternative) were updated to 2007 dollars, shown in attachment I. Updated costs for the preferred alternative were not included here for comparison with the other alternatives.

Comparison of Alternatives by All Factors

Each alternative was rated within each factor and compared to each other numerically (1 through 12), with 12 being the least impacting or least costly. Each factor was then given a weight of importance for implementation of the proposed project (tables IV-5 and IV-6).⁹

Two separate analyses were done—one with all nine factors considered to reflect the overall alternative comparison and the other using only the environmental factors to reflect the environmentally preferred alternative (least impacting). The environmental factors—endangered species, environmental resources, socioeconomics, and cultural resources—were used to reflect the least impacting alternative.

The rating (1 through 12) of each alternative under each factor was multiplied by the weighting of each factor. The products for each were added together to give a total score of each alternative, and the alternatives were arranged, high to low, with high being the best. This process was done for the nine combined factors as well as only the environmental factors. For more information about the weighting process and the results, see attachment J.

Capital Cost.—The comparison of the total estimated capital cost per acre-foot of water delivered to implement the alternatives shows the SJRPNM Alternative is the least costly. These comparisons are based on October 2001 price levels. The SJRPNM Alternative was projected to have one of the shortest lengths of pipeline to construct for delivering water to the service area and had the least costly river diversion.

OM&R.—The NIIP Coury Alternative had the least projected cost per acre-foot to operate and had fewer facilities to maintain and the lowest power cost.

Endangered Species.—The NIIP Moncisco and NIIP Coury Alternatives had the least potential to impact endangered species because they had less potential for impacting critical habitat and populations of endangered aquatic, wildlife, and vegetation resources.

⁹ For weighting and ranking purposes, the 2020 design capacities were treated as viable alternatives.

Table IV-5.—Alternative selection criteria
(May 14, 2003)

Alternatives	Total cost per acre-foot	OM&R per acre-foot NTUA	Endangered species	Environmental resources	Cultural resources	Drinking water quality	Socio-economics	Acceptability	Risk	Total	Combined resource rank
SJRPNM	12	4	5.5	12	11	2.5	9.5	12	11	72.54	12
Rank*weight ¹	20.00	6.67	9.17	20.00	2.75	0.42	2.38	2.00	9.17	72.54	
SJR Infiltration	11	5	1	10	9	2.5	9.5	11	7	57.71	8
Rank*weight	18.33	8.33	1.67	16.67	2.25	0.42	2.38	1.83	5.83	57.71	
NIIP Mondisco	7	11	9.5	2	1	8.5	9.5	10	1	55.71	7
Rank*weight	11.67	18.33	15.83	3.33	0.25	1.42	2.38	1.67	0.83	55.71	
NIIP Coury	8	12	9.5	7	7	8.5	9.5	8	3	70.21	11
Rank*weight	13.33	20.00	15.83	11.67	1.75	1.42	2.38	1.33	2.50	70.21	
NIIP Cutter	5	10	7	1	7	8.5	9.5	9	7	51.21	5
Rank*weight	8.33	16.67	11.67	1.67	1.75	1.42	2.38	1.50	5.83	51.21	
NIIP Amarillo	10	8	3	4	7	8.5	9.5	7	4.5	52.13	6
Rank*weight	16.67	13.33	5.00	6.67	1.75	1.42	2.38	1.17	3.75	52.13	

¹ * denotes "multiplied by."

Notes:

- Capital cost
 - OM&R
 - Endangered species and environmental impacts (e.g., depletions from San Juan River, Southwestern willow flycatcher, Mexican frog, and cacti).
 - Environmental resources
 - Cultural resources
 - Drinking water quality
 - Socioeconomic
 - Acceptability
 - Risk
 - Total
- The costs of construction (including contract and noncontract [indirect]) per acre-foot of water.
 - Operations, maintenance, replacement, and energy costs (energy costs are part of operations).
 - Endangered species and environmental impacts (e.g., depletions from San Juan River, Southwestern willow flycatcher, Mexican frog, and cacti).
 - Environmental other than endangered species (e.g., aquatic, land use, habitat, recreation, and regulatory).
 - Impacts to archeological, ethnographic, and in-use sites.
 - Quality of water from the source (all alternatives meet safe drinking water standards; NIIP water has a lower concentration of salts).
 - Social and economic impacts.
 - Project sponsor ranking (e.g., 2020 less acceptable than 2040, impacts to NIIP operations and future development, unit cost of water for year 2020 is higher for the city of Gallup and Jicarilla Apache Nation).
 - Reliability and constructability.
 - Total points including the weight.

For ranking and weighting purposes, there are 12 alternatives for the project (the 6 alternatives at 2 design capacities each—2020 and 2040). For all rankings, see attachment J. Each selection criterion is ranked between 1–12, with 12 being the preferred and 1 the least preferred. Each criterion is weighted and the points associated with an alternative for a specific criterion are then rank weighted for that criteria (e.g., a rank of 10 out of 12 with a weight of 20 derives 16.67 points).

Table IV-6.—Alternative comparison for environmental factors
(May 14, 2003)

Alternatives	Endangered species	Environmental resources	Cultural resources	Socioeconomics	Total	Environmental preferred rank
SJRPNM	5.5	12	11	9.5		12
Rank*weight ¹	13.75	30.00	18.33	15.83	77.92	
SJR Infiltration	1	10	9	9.5		8
Rank*weight	2.50	25.00	15.00	15.83	58.33	
NIIP Moncisco	9.5	2	1	9.5		7
Rank*weight	23.75	5.00	1.67	15.83	46.25	
NIIP Coury	9.5	7	7	9.5		11
Rank*weight	23.75	17.50	11.67	15.83	68.75	
NIIP Cutter	7	1	7	9.5		5
Rank*weight	17.50	2.50	11.67	15.83	47.50	
NIIP Amarillo	3	4	7	9.5		6
Rank*weight	7.50	10.00	11.67	15.83	45.00	

¹ * denotes "multiplied by."

Notes:

- Endangered species – Endangered species and environmental impacts (e.g., depletions from San Juan River, Southwestern willow flycatcher, Mexican frog, and cacti).
- Environmental resources – Environmental other than endangered species (e.g., aquatic, land use, habitat, recreation, and regulatory).
- Cultural resources – Impacts to archeological, ethnographic, and in-use sites.
- Socioeconomic – Impacts to quality of life and economic growth.
- Total – Total points including the weight.

Twelve alternatives for the proposed project (the 6 alternatives at 2 design capacities each—2020 and 2040—were evaluated; however, only 2040 design capacity alternatives are shown here). Each selection criteria is ranked between 1–12, with 12 being the preferred and 1 the least preferred. Each criterion is weighted and the points associated with an alternative for a specific criterion is then rank weighted for that criterion (e.g., a rank of 10 out of 12 with a weight of 20 derives 16.67 points).

Environmental Resources.—The SJRPNM and San Juan River Infiltration Alternatives had the least potential to impact non-endangered environmental resources because additional water would be released from Navajo Reservoir into the San Juan River to the diversion point. The San Juan River Infiltration Alternative has a larger riparian impact area and, therefore, had a lower ranking than the SJRPNM Alternative.

Cultural Resources.—The SJRPNM Alternative is predicted to have the fewest impacts to cultural resources.

Drinking Water Quality.—Water from Navajo Reservoir is expected to have better quality than water from the San Juan River. The proposed water treatment for all alternatives

would provide water that would meet Safe Drinking Water Act quality standards. Some quality parameters, such as total dissolved solids, would not be reduced by the proposed treatment and would reflect the raw water levels. All alternatives that would use water from Navajo Reservoir were ranked highest in this category.

Socioeconomics.—Providing water for quality of life improvement and economic growth were the primary socioeconomic factors used in comparing the alternatives. Alternatives that would provide water for the estimated population growth to year 2040 were ranked higher than the design capacities for 2020 needs. The temporary positive contribution to the economy through the infusion of construction money and jobs was not significantly different among the alternatives.

Acceptability.—This element is considered the proposed project participants’ concept of the preferred alternative. The factors they considered in this element were political acceptability and compatibility with future development or vision. Letters were received from the Navajo Nation and the city of Gallup supporting the SJRPNM Alternative. The Jicarilla Apache Nation did not have a specific alternative preference under this criterion. The SJRPNM Alternative was given the highest ranking, followed by the San Juan River Infiltration Alternative.

Risk.—The factors under this criterion are constructability and reliability. Alternatives that were considered technically unproven or sophisticated with a high level of unknowns were rated lower for constructability. Alternatives that had less reliable elements (e.g., those that depended on other projects like the NIIP) were given a lower rating. The SJRPNM Alternative had the highest ranking because it would use proven technology, has fewer unknowns, and would be less dependent on the NIIP.

ALTERNATIVES CONSIDERED BUT ELIMINATED

Nonstructural Alternatives Eliminated

The No Action and Water Conservation Alternatives did not meet the *Principles and Guidelines*’ four tests of viability; therefore, the Water Conservation Alternative was screened out and the No Action Alternative was retained solely for NEPA requirements.

Water Conservation – Water conservation opportunities are currently being implemented, and significant additional water conservation measures within the service area are not available. This is evident through the relatively high water rates and low use

in Navajo communities in the proposed project area and the city of Gallup. Continued conservation will help the city of Gallup meet short-term needs, and it would be essential in addition to the proposed project's surface water supply to meet long-term needs.

Water Reuse – Treated effluent is currently being used for the golf course and park irrigation and is seriously being considered for direct reuse as drinking water by the city of Gallup. The quantity of water available will only supplement the anticipated project surface water supply.

Conjunctive Use of Groundwater and Aquifer Storage – Conjunctive use groundwater, in addition to surface water, is considered part of the plan to provide a long-term water supply for the proposed project area. Aquifer storage and recovery would require further analysis to determine if it would be applicable. If feasible, storage and recovery could provide additional water management opportunities, but would not alleviate the need for a long-term surface water supply in addition to available groundwater.

Structural Alternatives Eliminated

The 2020 capacity alternatives were not retained for further analysis because their capacity would be exceeded by the time the proposed project was completed; therefore, the alternatives listed below are for the 2040 capacity.

NIIP Moncisco – This alternative had an overall combined ranking of 7 and an environmental ranking of 7 out of 12. Its present worth ranking was 2 out of 6. Therefore, it was not considered for further analysis.

NIIP Cutter – This alternative had an overall combined and environmental ranking of 5 out of 12. Its present worth ranking was 1 out of 6; therefore, it was not considered for further analysis.

NIIP Coury – This alternative had an overall and environmental ranking of 11. Its present worth ranking was 3 out of 6. This was a competitive alternative, but because of its high construction costs and risk factors associated with being tied to the NIIP Canal, it received a lower ranking and was not considered further.

San Juan River Infiltration – This alternative had an overall and environmental ranking of 8 out of 12. Its present worth ranking was 4 out of 6. Its weaknesses were risk associated with installing and maintaining the drainage gallery and a greater impact to the riverine area. This was a competitive alternative, but it was not as favorable as other alternatives in any factor.

PREFERRED ALTERNATIVE SELECTION

The result of all the analyses discussed in this chapter was the retention of the SJRPNM and NIIP Amarillo Alternatives. The No Action Alternative was retained for comparison and for NEPA compliance purposes.

The SJRPNM Alternative is the highest ranked in the comparison of the entire range of factors. The comparison of only the environmental factors also ranked the SJRPNM Alternative the highest, and for this reason, it is considered the environmentally preferred alternative. The present worth of the total alternative costs (capital and OM&R) is the factor used to compare the NED attributes of each alternative. The SJRPNM Alternative had the lowest present worth (highest ranked) assuming electrical power at CRSP rates.¹⁰ The NIIP Amarillo Alternative had the lowest present worth (highest ranked) assuming NTUA power rates.

The evaluation of these two action alternatives was continued into Chapter V–Affected Environment and Environmental Consequences. The result of this analysis, shown in table V-19, is that the SJRPNM Alternative has fewer negative and more positive impacts than the NIIP Amarillo Alternative.

The conclusion of this alternative analysis is that the SJRPNM Alternative is superior from an economic, environmental, and overall perspective. In addition, the Navajo Nation formally identified this alternative as their preferred alternative. More detailed environmental analyses are presented in later chapters. Attachment I presents a specific, detailed description of the SJRPNM Alternative, including a physical description and cost estimates at January 2007 levels, and an economic analysis, including cost allocation, cost/benefit analysis, socioeconomics, and associated project details.

¹⁰ Since this analysis, costs and present worth for the preferred alternative were updated to 2007 dollars, shown in attachment I.



Chapter V

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

Setting

Navajo Reservoir Operations

Affected Resources

Other Impacts Considerations

Conclusions and Summary of Impacts

INTRODUCTION

This chapter presents a description of the environment and how it may be affected by the No Action, San Juan River Public Service Company of New Mexico (SJRPNM), and Navajo Indian Irrigation Project (NIIP) Amarillo Alternatives. These alternatives are described in chapter IV. This chapter is organized by resource topic. Under each resource is an overview, a discussion of the affected environment, the methodology used to determine impacts, an impacts analysis, and potential mitigation measures. Each resource topic concludes with a summary of impacts.

The impacts analysis presents short-term, long-term, direct, indirect, and cumulative effects on resources and, when applicable, potential mitigation measures. It assumes that related projects described in chapter I—the NIIP, San Juan River Basin Recovery Implementation Program (SJRBRIP), Animas-La Plata (ALP) Project, and Navajo Reservoir Operations—are fully implemented. There would, however, be an interim period, possibly decades, before full development of these projects, and during this time additional San Juan River water would be available to meet other purposes, as discussed in the Navajo Reservoir Operations Final Environmental Impact Statement (FEIS) (Bureau of Reclamation [Reclamation], 2006).

In this chapter, the resources described are those potentially affected by or central to changes related to the Navajo-Gallup Water Supply Project (proposed project) and include water uses and water resources, Indian Trust Assets (ITAs), water quality, vegetation, wildlife and aquatic resources, special status species, recreation, land use, hazardous material sites, soils and geology, paleontology, air quality, socioeconomics, environmental justice, land use, and cultural resources.

Potential measures to mitigate adverse impacts of the proposed project are presented in this chapter, and environmental commitments are described in chapter VI.

SETTING

For purposes of the impacts analysis, the study area (frontispiece map) includes Navajo Reservoir in New Mexico and Colorado; the San Juan River and its flood plain downstream from the reservoir in New Mexico, Colorado, and Utah to Lake Powell; Navajo Nation Reservation lands, specifically in and near more than 230 miles of pipeline corridors; the southwest portion of Jicarilla Apache Reservation lands; and the city of Gallup, New Mexico. Under some resource topics (e.g., economics and social factors), the study area includes a larger geographic area in order to reflect the scope of impacts to those resources. The frontispiece map shows the general project area. Figure V-1 identifies the approximate location of gauging stations and primary locations along the San Juan River.

The proposed project area includes three major river basins—those of the Upper Colorado River, Lower Colorado River, and Rio Grande. Most of the project is located within the San Juan River sub-basin of the Upper Colorado River Basin. The San Juan River sub-basin encompasses approximately 25,000 square miles, and the river extends 350 miles from its headwaters in the San Juan and La Plata Mountains of Colorado to Lake Powell. The river has drainages that cross reservation lands of the Ute Mountain Ute Tribe, Southern Ute Indian Tribe, and the Navajo and Jicarilla Apache Nations and extends approximately 225 miles from Navajo Dam to the San Juan arm of Lake Powell near Paiute Farms.

The region south of the San Juan River, which is predominately Navajo Nation Reservation lands, is characterized by desert landscape, where broad dry washes carry significant sediment loads during periodic thunderstorms. The area is semiarid to arid; most of the San Juan River Basin (Basin) is less than 6000 feet in elevation and receives less than 8 inches of precipitation annually. Sandstone rocks are interspersed with shale, volcanic, and igneous rocks. There are mesas, cliffs and canyons, rock terraces, and dry arroyos. The San Juan River is the only perennial stream of significance in the area; its corridor supports riparian vegetation such as cottonwood, willow, and non-native salt cedar and Russian olive. Where better soils occur, vegetation is used as open rangeland for cattle and sheep. Overgrazing of the native vegetation has denuded many areas, and on these unprotected soils, erosion is severe. Wildlife species are primarily limited to those that are adapted to drier conditions, except along the San Juan River valley.

Towns and communities in New Mexico in the northern part of the study area include Farmington at the confluence of the San Juan and Animas Rivers; Bloomfield, Blanco, and Archuleta upstream; and Fruitland and Shiprock downstream from Farmington. Energy development, agriculture, power production, tourism, and recreation are important industries in the area.

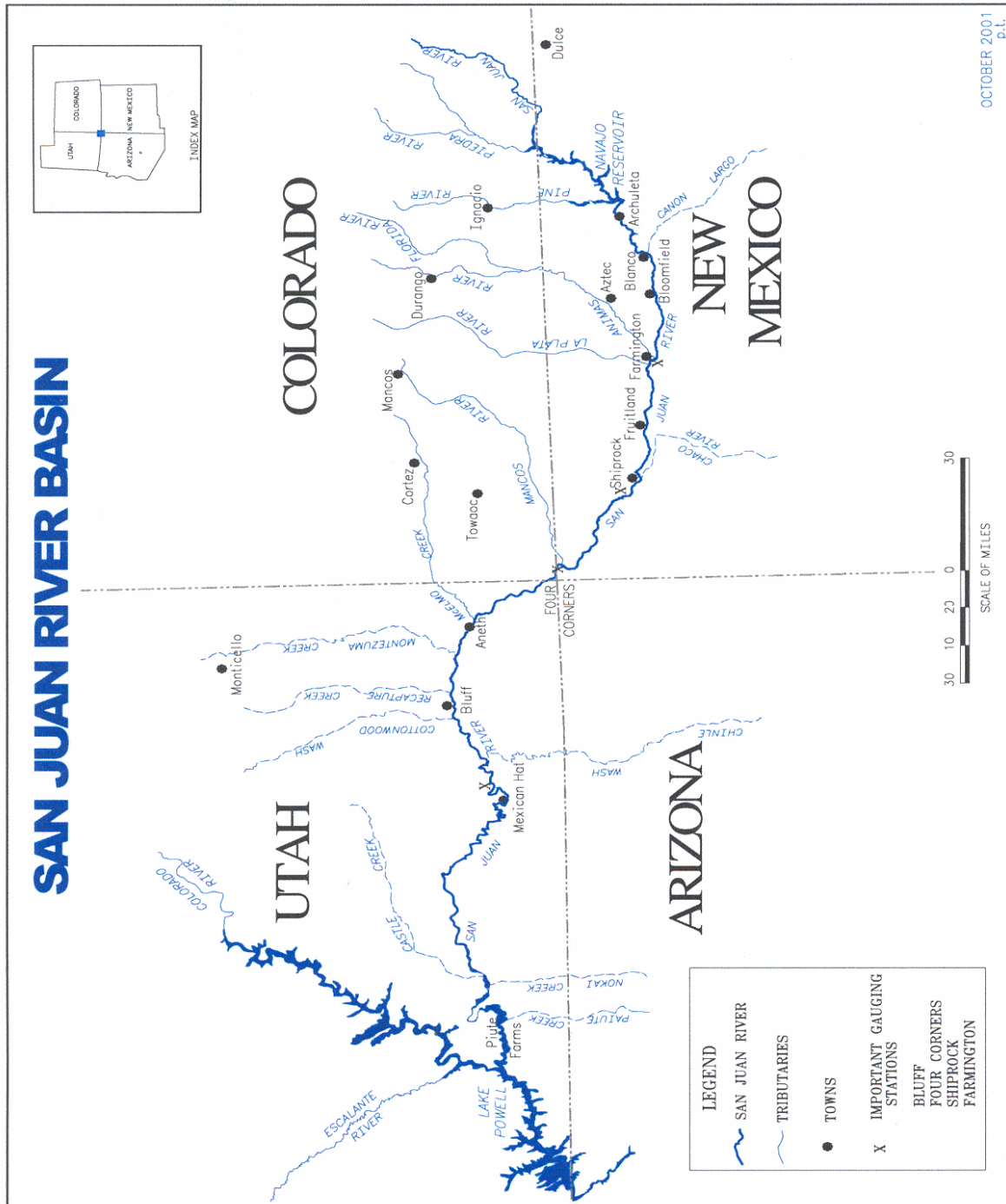


Figure V-1.—River mile locations and gauging stations.

In the southern part of the proposed project area, the city of Gallup, although located off-reservation, has a significant and growing population (estimated currently at 36 percent) of Native American residents. As noted in chapter I, the city serves as an economic center for the surrounding area. To the east, the community of Crownpoint is the site of the Eastern Navajo Agency of the Bureau of Indian Affairs (BIA). To the west, Window Rock is the capital and center of government of the Navajo Nation, and nearby Fort Defiance also houses government functions and a large regional hospital. More than 20 smaller communities are located along Route 491 between the city of Gallup and Shiprock.

These areas around the city of Gallup are drained by a stream—the Rio Puerco of the West (Lower Colorado River Basin). The Rio Puerco of the West is the largest drainage in the area, originating east of the city of Gallup and flowing southwest into Arizona. Flow in the Rio Puerco of the West is intermittent, usually associated with thunderstorms and spring snowmelt, and is short-lived.

Navajo Nation lands in the southeastern portion of the proposed project area are within the Rio Grande Basin. These include the Huerfano, Nageezi, Counselor, Pueblo Pintado, Whitehorse Lake, Ojo Encino, and Torreon Chapters of the Navajo Nation.

NAVAJO RESERVOIR OPERATIONS

Reclamation, in April 2006, completed the Navajo Reservoir Operations FEIS, and the Navajo Reservoir FEIS Record of Decision (ROD) was signed in July 2006. In accordance with the ROD, the reservoir will be operated in the future so that releases from Navajo Dam will generally range between 250 to 5,000 cubic feet per second (cfs) (the FEIS 250/5000 Alternative). For further details on this and other related projects, see the “Cumulative Impacts, Operation of Navajo Dam” section).

AFFECTED RESOURCES

To identify affected resources, issues were derived by using the scoping process, review of agency and public comments, and meeting with cooperating agencies.¹ Significant issues are discussed for each resource.

¹ Cooperating agencies for preparation of the environmental impact statement portion of this document include the Navajo and Jicarilla Apache Nations, State of New Mexico, Northwest New Mexico Council of Governments, city of Gallup, Navajo Tribal Utility Authority, BIA, and Indian Health Service.

Water Uses and Resources

This section addresses the potential impacts to water rights and water supplies that could result from actions associated with the proposed project alternatives considered.

Issue: How would the No Action and action alternatives affect water rights, riverflows, reservoir levels, and water uses?

Overview

Scope

The scope includes Navajo Reservoir and the San Juan River to Lake Powell. For water rights discussions, the scope is extended to the Upper and Lower Colorado River and Rio Grande Basins.

Impact Indicators

Impacts to water resources are indicated by effects on the following:

- (1) Senior water right holders or contractors from the Navajo Reservoir supply
- (2) Existing water users in the Basin
- (3) Identified future uses for which valid water rights and environmental clearances are in place
- (4) Implementation of the Flow Recommendations formulated by the SJRBRIP for endangered fish and designated critical habitat, or exceeding the existing depletions included in the Endangered Species Act (ESA) baseline
- (5) Future water use, including the exercise of American Indian (Indian) water rights under the protection of the U.S. Department of the Interior (Interior)
- (6) The Upper Basin States' ability to develop and use their compact apportionment²

Water Uses and Resources – Affected Environment

Navajo Reservoir.—Navajo Reservoir has a maximum content of 1,701,300 acre-feet as measured at the spillway crest (at elevation 6085 feet) with a corresponding water

² Colorado River Compact (1922) and Upper Colorado River Compact (1948).

surface area of 15,610 acres. The inactive content, defined as the storage below the NIIP inlet works, is 625,675 acre-feet with a corresponding water surface elevation of 5985 feet. During the irrigation season, the minimum operating level for the NIIP diversion intake is at elevation 5990 feet, or 661,800 acre-feet of storage; however, the reservoir can be drawn down during the winter to elevation 5985 feet, or 625,675 acre-feet of storage, as long as the reservoir recovers sufficiently prior to the NIIP irrigation season.

San Juan River.—The San Juan River below Navajo Dam is the largest river in the Basin and collects inflow from perennial tributaries—the Animas, La Plata, and Mancos Rivers—and other intermittent tributaries. At its confluence with Lake Powell, the San Juan River produces a long-term average natural flow³ of about 2.0 million acre-feet⁴ (MAF). The San Juan River above the Animas River confluence contributes about one-half of this amount.

Mean annual runoff to the San Juan River at Farmington just downstream of the confluence with the Animas River is about 1.3 MAF under present depletion conditions. Near Bluff, Utah, mean annual runoff increases to about 1.4 MAF under present conditions. The increase is accounted for by tributary or side inflow downstream of Farmington.

As with the other rivers, flows peak in the spring and remain low from summer to fall, punctuated by short-duration peaks resulting from storm events. The river is partially regulated by Navajo Dam, and its tributaries are substantially used for irrigation. Navajo Dam has tended to reduce peak spring flows and to supplement flows in other seasons since its operation began in 1962. Implementation of Flow Recommendations, as described in the Navajo Reservoir Operations FEIS, would result in a more “natural” hydrograph with higher spring flows and lower base flows, as depicted in figure V-2 (Holden, 1999; Reclamation, 2006).

Water Rights Background.—See chapter I, “Water Rights Background,” for information about Indian water rights, the Colorado River compacts, and the La-Plata River and Animas-La Plata compacts.

New Mexico –

New Mexico Water Law – New Mexico water law is based on the prior appropriation doctrine. Basically, the first user (appropriator) in time has the priority

³ Natural flows are flows that would exist in the San Juan River, excluding any manmade uses of the flows.

⁴ Natural flow data for the period 1929–93 developed for the SJRBRIP.

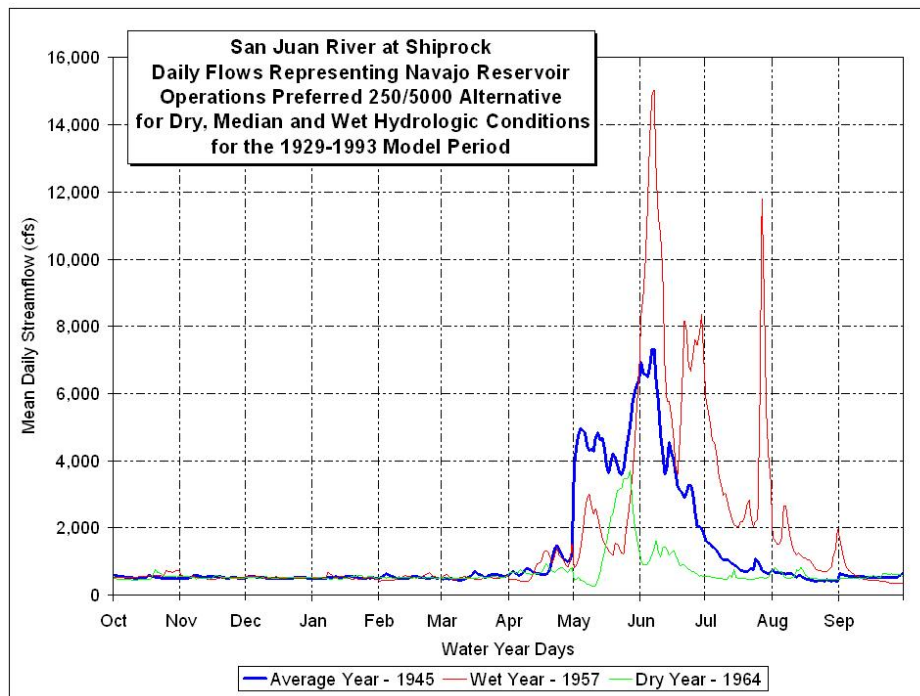


Figure V-2.—Hydrograph of San Juan River at Shiprock.

to take and use water. The State Engineer has the primary responsibility for supervision, measurement, appropriation, administration, and recordkeeping. The State courts have primary responsibility with respect to quantifying water rights when there is a general stream adjudication.

Navajo Nation and Jicarilla Apache Nation Uses – For much of its path from Navajo Dam to Lake Powell, the San Juan River either flows through or forms the northern boundary of the Navajo Nation. The Basin has not been fully adjudicated. Not all Navajo Nation reserved water rights in the Basin have been quantified. However, the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (Navajo Settlement Agreement), once executed by the Secretary of the Interior (Secretary), will settle the Nation’s water right claims in the Basin in New Mexico. The proposed project is a cornerstone piece of the Navajo Settlement Agreement. The Congress, as part of Public Law (P.L.) 111-11 (see attachment P), approved the Navajo Settlement Agreement and authorized the proposed project. Under P.L. 111-11, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010. Potential impacts of alternatives on Navajo Nation water rights are discussed in the “Indian Trust Assets” section of this chapter.

The Jicarilla Apache Nation’s water rights in the Basin are under the 1992 Jicarilla Apache Tribe Water Rights Settlement Act (Jicarilla Settlement Act) and a 1999 Partial

Final Decree in the San Juan River. The Jicarilla Apache Nation’s adjudication includes the right to deplete 25,500 acre-feet per year (AFY) from the Navajo Reservoir water supply or the Navajo River on its reservation. These rights include depletions for historic and existing uses with a priority date of September 21, 1880, totaling approximately 2,195 AFY for surface water diversions and approximately 2,187 AFY for evaporation. The Jicarilla Apache Nation also has a right to 6,500 AFY of San Juan-Chama Project water. Potential impacts of alternatives on Jicarilla Apache Nation water rights are also discussed in the “Indian Trust Assets” section.

Water Permits Held by the United States – In the early 1950s, planning for development of the water supply apportioned to New Mexico by the Upper Colorado River Basin Compact was concentrated on several major Federal projects that would put to use the undeveloped water available to New Mexico. The filing on water rights by private entities and subsequent related activities—coupled with the advanced planning for the Federal projects for which no water had been reserved by a water right filing—led the New Mexico Interstate Stream Commission (NMISC) in 1955 to file several notices of intention to appropriate water for use, which were later assigned to Interior. The NMISC filed an additional notice of intention in 1957 for additional water to be provided from Navajo Reservoir. Table V-1 lists the New Mexico permits now held by the United States for water use in the Basin. Water uses by the San Juan-Chama Project and the NIIP, and under other contracts for the Navajo Reservoir supply, must share shortages in the supply in accordance with section 11 of P.L. 87-483.

Table V-1.—New Mexico permits held by the United States¹

Office of State Engineer file numbers	Purpose	Diversion quantity (acre-feet/year)	Priority dates
2847	San Juan-Chama Project	235,000	June 17, 1955
2848	Hammond Project	23,000	June 17, 1955
2849	NIIP	630,000	June 17, 1955
2873	Navajo Reservoir evaporation loss	28,800	January 17, 1956
2883	ALP Project	49,510	May 1, 1956
2917	Irrigation, domestic, industrial, mining, and power purposes – San Juan-Chama Project	225,000	September 16, 1957
3215	Municipal and industrial purposes (Note: permit is a direct flow right)	500 cfs	December 16, 1968

¹ The diversion amounts shown reflect the diversion values in permits or notices of intention and do not reflect actual diversions currently taking place. A permit under file Nos. 2847, 2849, 2873, and 2917 combined was issued on March 6, 1958. File No. 3215 is for the diversion and use of tributary or side inflow entering the San Juan River below Navajo Dam to supplement the water supply available for meeting deliveries under Navajo Reservoir water supply contracts for those contract uses diverting below Navajo Dam.

Under contracts with the Secretary, users of the Navajo Reservoir water supply include the Navajo Nation for use on the NIIP, the Jicarilla Apache Nation pursuant to its Settlement Act, and several small-use contractors. The Jicarilla Apache Nation currently subcontracts portions of its Navajo Reservoir water supply allocation to the Public Service Company of New Mexico for use at the San Juan Generating Station and others.

Other Water Rights Downstream of Navajo Dam – The San Juan River and its tributaries are the source from which New Mexico’s entire consumptive use apportioned by the Upper Colorado River Basin Compact can be reasonably supplied. There are numerous water rights in New Mexico on the San Juan River downstream of Navajo Dam. The water is used for municipal and industrial (M&I) purposes and irrigation. Table V-2 shows a listing of the water rights between Navajo Dam and the Public Service Company of New Mexico (PNM) diversion.

Table V-2—Preliminary list of San Juan River water rights between Navajo Dam and the Animas River confluence

User	Priority dates	Diversion right (cfs)
Citizens Ditch		
Bloomfield Irrigation District	1879, 1881, 1900 ² , 1907, 1920, ¹ 1951, 1954, 10/24/55, 5/1/56 ¹ (ALP Project)	106
La Pampa Ditch	1888	10
Jaquez Ditch	1878	12
City of Bloomfield		4
El Paso Natural Gas		2
Others not listed		2
Subtotal		136
Navajo Dam Water Users Association	5/1/56 ¹ (ALP Project), 1973	2
Turley-Manzanares Ditch	1876	7
Hammond Canal	1944, 1947, 6/17/55 (Reclamation)	90
Giant Refinery	1881, 1907, 1947, 10/24/55, 5/1/56 ¹	2
Lee/Hammond Water Plant	1876 ¹ , 1881, 1896 ¹ , 1907, 1920 ¹ , 1930, 1945, 1947, 1953, 10/24/55, 5/1/56 ¹ (ALP Project)	3
City of Farmington	1907, 1947, 10/24/55/, 5/1/56 ¹ (ALP Project)	55
Subtotal		295

Notes: Diversion rights and priority dates are preliminary and were obtained from the State of New Mexico, Office of the State Engineer, in letters dated July 6, 2000, and March 13, 2003, respectively. All priority dates are for the San Juan River unless otherwise indicated. The ALP Project water rights listed are under a Reclamation filing.

¹ Animas River priority date.

² Pine River priority date.

Colorado – Colorado water law is based on the prior appropriation doctrine, which states that the first appropriator in time has the first priority to take and apply water to beneficial use without waste. The right to divert the unappropriated waters of natural streams to beneficial uses is never to be denied under Colorado’s constitution; the Colorado water courts grant decrees to use water and set priorities. The Colorado State Engineer and the Division of Water Resources administer the water rights according to the priorities, measure flows, and record the use of water. Use of Colorado’s compact apportionment can be supplied from many river sources, including the San Juan River. Numerous water rights exist in Colorado on the San Juan River upstream of Navajo Dam and on tributaries to the San Juan River.

Arizona – As stated above, the San Juan River either flows through or forms the northern boundary of the Navajo Nation. The main stem of the San Juan River does not flow through Arizona; however, all tributaries in Arizona to the San Juan River are on Navajo Nation lands. Water rights for the Navajo Nation on the tributaries in Arizona have not been quantified. The Navajo Nation claims sufficient water from these tributaries necessary to create a permanent homeland for the Navajo people.

Arizona is limited to an annual consumptive use of 50,000 acre-feet of water from the Upper Basin (depletion in flows at Lee Ferry) pursuant to its apportionment under the Upper Colorado River Basin Compact. In 2000, the total consumptive use of water in the Upper Basin in Arizona was about 38,100 AFY according to Reclamation’s *Consumptive Use and Loss Report 1996–2000*.

Utah – In Utah, water law is also based on the prior appropriation doctrine, and water use is managed in a manner similar to that of the State of Colorado. In Utah, the San Juan River forms the northern boundary of Navajo Nation Reservation lands. The same principle applies here with respect to the Navajo Nation claims for sufficient water to provide a permanent homeland for its people.

A number of non-Indian water rights exist on the north side of the San Juan River and on tributaries that drain into the San Juan River from the north. While the Colorado River Compact makes provisions for flows to be delivered from the Upper Basin to the Lower Basin at Lee Ferry, it does not require that specific amounts of water be contributed to Lee Ferry from the San Juan River or from any other particular Upper Basin tributary. The Glen Canyon National Recreation Area may have an unquantified Federal reserved water right on the San Juan arm of Lake Powell. This right would be junior to that for Navajo Reservoir, and the Navajo Unit has no obligation to bypass water for this right.⁵

Table V-3 shows the existing and future projects that have valid water rights and environmental clearances (included with the baseline depletion).

⁵ Personal communication between the National Park Service and Reclamation, February 6, 2002.

Table V-3—Baseline and current depletion summary in the Basin¹

Depletion category	RiverWare baseline (acre-feet)	Estimated current (acre-feet)	Presently unused (acre-feet)
New Mexico depletions			
Navajo lands irrigation depletion			
NIIP	² 280,600	160,330	120,270
Hogback	12,100	9,535	2,565
Fruitland	7,898	6,147	1,751
Cudei	900	715	185
Subtotal	301,498	176,727	124,771
Non-Navajo lands irrigation depletion			
Above Navajo Dam - private	738	575	163
Above Navajo Dam - Jicarilla	³ 2,190	350	1,840
Animas River	36,711	24,878	11,833
La Plata River	9,808	8,470	1,338
Upper San Juan	9,137	6,680	2,457
Hammond Area	10,268	7,507	2,761
Farmers Mutual Ditch	9,532	7,457	2,075
Jewett Valley	3,088	2,379	709
Westwater	110	110	0
Subtotal	81,582	58,406	23,176
Total New Mexico irrigation depletion	383,080	235,133	147,949
Non-irrigation depletions			
Navajo Reservoir evaporation	27,350	29,235	-1,885
Utah International	39,000	31,388	7,612
San Juan Powerplant	16,200	16,200	0
Industrial diversions near Bloomfield	2,500	2,500	0
Municipal and industrial uses	8,453	7,443	1,010
Scattered rural domestic uses	⁴ 1,400	1,400	0
Scattered stock ponds and livestock uses	³ 2,200	2,200	0
Fish and wildlife	³ 1,400	1,400	0
Total New Mexico non-irrigation depletion	98,503	91,766	6,735
San Juan-Chama Project exportation	107,514	107,514	0
Unspecified minor depletions	⁵ 4,500	2,500	2,000
Jicarilla Apache Nation Navajo River Water Supply Project	⁶ 6,570	0	6,570
Total New Mexico depletions (excluding ALP)	600,168	436,914	163,254

Table V-3—Baseline and current depletion summary in the Basin¹ (continued)

Depletion category	RiverWare baseline (acre-feet)	Estimated current (acre-feet)	Presently unused (acre-feet)
Colorado depletions – upstream of Navajo			
Upper San Juan	10,858	9,270	1,588
Navajo-Blanco	7,865	6,972	893
Piedra	8,098	6,892	1,206
Pine River	71,671	69,775	1,886
Subtotal	98,492	92,909	5,583
Colorado depletions – downstream of Navajo			
Florida	28,607	27,749	858
Animas	25,119	24,099	1,020
La Plata	13,245	13,049	196
Long Hollow	1,339	0	1,339
Mancos	19,532	15,516	4,016
Subtotal	87,842	80,413	7,429
Total Colorado depletions (excluding ALP)	186,334	173,322	13,012
Total Colorado and New Mexico combined depletions	786,502	610,236	176,266
ALP	⁷ 57,133	1,620	55,513
Subtotal	843,635	611,856	231,779
McElmo Basin imports	-11,769	-11,769	0
Utah depletions	⁸ 9,140	9,140	0
Arizona depletions	⁴ 10,010	10,010	0
Net New Mexico, Colorado, Utah, and Arizona depletions	851,016	619,237	231,779
New Mexico off-river depletions			
Chaco River	⁴ 2,832	2,832	0
Whiskey Creek	⁴ 523	523	0
GRAND TOTAL	854,371	622,592	231,779

¹ Baseline depletion values are from the Generation 2 San Juan River Basin Hydrology Model operated by the SJRBRIP and may change with new versions of the model or new basin hydrology. They are provided here as a reference point and would naturally be adjusted to match changes approved by the SJRBRIP.

² Includes 10,600 acre-feet of annual groundwater storage. At equilibrium this drops to 270,000 acre-feet, based on irrigation of the full 110,630 acres every year. The proposed schedule of anticipated depletions prepared by the NMISC to reflect the Navajo Settlement Agreement includes an equilibrium depletion for NIIP of 256,500 acre-feet based on an average fallow acreage of 5 percent. While including fallow land in the depletion calculation is reasonable, the larger number is used here to be consistent with the NIIP section 7 consultation and the full capacity of the project.

³ The Jicarilla Apache Nation recognizes this historic depletion as 2,195 acre-feet, but it was modeled as 2,190 acre-feet on average.

⁴ Indicates offstream depletion accounted for in calculated natural gains.

⁵ 1,500 acre-feet of depletion from minor depletions approved of SJRBRIP in 1992. 3,000 acre-feet from 1999 intra-service consultation, a portion of which may be in Colorado.

⁶ Biological opinion lists this depletion as 6,654 acre-feet, but model configuration shows 6,570. Model configuration used.

⁷ Actual approved depletion is 57,100 acre-feet. Small changes in reservoir evaporation between runs results in small variation from actual project depletion. Exact match would require multiple iterations because of model limitations.

⁸ 1,705 San Juan River depletion; 7,435 off-stream depletion.

Water Uses and Resources – Methodology

The following measures were used to evaluate the impacts to water rights and uses under the No Action, SJRPNM, and NIIP Amarillo Alternatives.

- Researching the number of water rights and quantifying the amounts of water associated with each water right
- Researching available water diversion records and determining possible impacts due to changes in flows in the San Juan River resulting from operation of the proposed project
- Examining and comparing a hydrologic model output for each construction alternative to the No Action Alternative to determine possible variations in flow from the future operation of the proposed project and the way in which these variations may affect water use (Reclamation, 2004)
- Observing actual operations of the diversion structures during the Navajo Dam Summer Low Flow Test conducted from July 9 to July 15, 2001 (Reclamation, 2002b)

Water Uses and Resources – Impact Indicators

The following assumptions and conditions were made for the analysis:

- (1) An underlying assumption in analysis of the impact to water resources was that New Mexico water law, based on the prior appropriation doctrine, would be maintained. All existing depletions are intended to be represented in the hydrology model used for analysis. Comparing the model depletions with and without the action reveals differences among alternatives.
- (2) Future uses with valid water rights and environmental clearances, when necessary, were handled in the same manner as existing water uses using the same impact indicators (e.g., completion of the NIIP was modeled as a depletion for its full water rights acreage).
- (3) Navajo Dam would be operated as described in the preferred alternative in the Navajo Dam Operations FEIS to implement Flow Recommendations. In the Navajo Dam Operations FEIS, flow statistics were based on the modeled period of 1929–93 and compared to the Flow Recommendations criteria, and Navajo Dam operations were adjusted until the Flow Recommendations could be met. The inability to implement the SJRBRIP was considered to be an impact to the endangered fish. A Navajo Depletion Guarantee is included as a component of both action alternatives to ensure that proposed project depletions do not result in

exceeding the depletions included in the current Flow Recommendations (encompasses all projects currently modeled in the ESA baseline at full development). The Navajo Depletion Guarantee is discussed in greater detail in Chapter VI—Environmental Commitments and Mitigation Measures.

- (4) It should be considered whether there are any impacts on the following projects:
 - (1) Colorado Ute and Navajo Indian water uses pursuant to the Colorado Ute Indian Water Rights Settlement Act of 1988, P.L. 100-585, as amended (P.L. 106-554) (Ute Settlement Act) and the 2000 Settlement Act amendments (which also authorize the ALP Project and its component Navajo Nation Municipal Pipeline [NNMP]);
 - (2) Jicarilla Apache Nation water uses pursuant to the Jicarilla Settlement Act;
 - (3) completion of the NIIP; or
 - (4) the exercise of senior Indian water rights for uses without environmental clearances (more detail is provided in the “Indian Trust Assets” section of this chapter).

- (5) The Upper Basin States’ ability to develop and use their compact apportionment and the use of Upper Basin water in the Lower Basin (Gallup/Window Rock areas) were taken into consideration.

Water Uses and Resources – Impacts Analysis

No Action Alternative.—Reservoir elevations for the No Action Alternative would generally be lower than those under the action alternatives because additional water would not be stored in Navajo Reservoir to meet the demands of the proposed project. A combination of natural flows, bypasses, and releases from Navajo Reservoir would be used to meet existing downstream senior water rights and implement the Flow Recommendations. The spring releases would reach 5,000 cfs when sufficient water is available, and releases would be decreased to as low as 250 cfs when necessary to provide the recommended flows through the critical habitat area and to conserve water. A 250-cfs release from Navajo Reservoir during the irrigation season results in low flows from below the Citizens Ditch diversion to the Animas River confluence due to irrigation diversions; however, during the Navajo Dam Summer Low Flow Test, it was determined that a 250-cfs release would meet senior water rights (Reclamation, 2002b). Currently, some flexibility in reservoir releases exists because water committed under present water rights and/or future development is not fully used. This may be a significant amount of water in many, but not all, years. The release of this water is incorporated into operations to augment the minimum 250 cfs release during the irrigation season with a goal of minimum releases of 350 cfs.

The application of impact indicators (see previous indicators discussion) was used to predict future resource conditions under the No Action Alternative. Release patterns would generally follow the pattern described in the 250/5000 Alternative (Flow Recommendations) as described in the Navajo Reservoir Operations FEIS. Many of the Navajo Nation residents would continue to haul water for domestic uses, and the

Navajo Nation and the city of Gallup would continue to use existing permitted groundwater wells. Additional water conservation would be needed to meet current and future water demands. The Jicarilla Apache Nation would need to construct alternate delivery facilities or sources of water for development of the southwestern portion of Jicarilla Apache Reservation lands.

Under the No Action Alternative, the following water uses would continue:

- (1) Future uses with valid water rights and environmental clearances (National Environmental Policy Act [NEPA] and ESA) would likely continue assuming that the SJRBRIP continues to function and serves as the reasonable and prudent measure (RPM) and/or reasonable and prudent alternative (RPA) for adverse impacts to listed species.
- (2) Navajo Dam would continue to be operated to assist in meeting the Flow Recommendations.
- (3) The following projects and uses would continue: (1) Colorado Ute and Navajo Indian water uses pursuant to the 1988 Colorado Ute Settlement Act and the 2000 Settlement Act amendments (which also authorize the ALP Project and its component NNMP); (2) Jicarilla Apache Nation water uses pursuant to the Jicarilla Settlement Act; and (3) completion of the NIIP.
- (4) The No Action Alternative would not limit the Upper Basin States' right to develop and use their compact apportionment. Apportionment planned for use in the proposed project may be available for other projects within the Basin.
- (5) If the proposed project is not constructed as described in P.L. 111-11 and the Navajo Settlement Agreement is not implemented, the Navajo Nation could be forced to reinitiate claims that would continue the uncertainty within the Basin and have significant adverse effects on other water users in the Basin. In addition, water conservation measures included in the No Action Alternative are not adequate to meet current and future water demands. The city of Gallup would likely attempt to expand its groundwater uses, which could face objections by many parties in the Gallup area.

SJRPNM Alternative.—Navajo Reservoir elevations for the SJRPNM Alternative would generally be higher than those of the No Action Alternative (1.3-foot increase in mean reservoir elevation) because of the increased storage needed, on average, to make releases from Navajo Reservoir meet project demands (table V-4). The proposed project is designed to divert a total of 37,764 AFY from the San Juan River with a resulting depletion of 35,893 acre-feet, based on 2040 projected population with a demand rate of 160 gallons per capita per day (gpcd). A total of 33,119 acre-feet would be diverted from the San Juan River at the PNM diversion (river mile [RM] 166.7), and

4,645 acre-feet would be diverted through the existing NIIP facilities at Navajo Reservoir (RM 225) to Cutter Reservoir via the NIIP Canal system to meet project water demand.

Table V-4.—Navajo Reservoir content and releases for the alternatives

Alternative	Project depletions from the San Juan River	Mean reservoir elevations	Mean average flows for the San Juan River ¹
No Action	No project depletions	6,057.1 feet	1,444 cfs
SJRPNM	35,893 acre-feet	1.3-foot increase	4.6-cfs increase
NIIP Amarillo	35,893 acre-feet	0.9-foot increase	1.2-cfs decrease

¹ Average of five San Juan River gauges.

A combination of natural flows, bypasses, and releases from Navajo Reservoir would be used to meet existing downstream senior water rights and the Flow Recommendations. During higher riverflows, natural riverflows would be used to meet the PNM diversion portion of the water demand. Mean average flows in the San Juan River would increase by 4.6 cfs to meet the PNM diversion portion of the water demand and to continue to meet Flow Recommendations downstream of the PNM diversion. Under certain low flow conditions, the SJRPNM Alternative would increase river base flows in the San Juan River from Navajo Dam to the PNM diversion (58.3 river miles) by as much as 16 percent, which would benefit other resources dependent on base flows.

The application of evaluation criteria (see previous indicator discussion) disclosed the following potential impacts:

- (1) Under the SJRPNM Alternative, there would be no adverse impact to existing active water use in the Basin.
- (2) There would be no adverse impacts to future uses with valid water rights and modeled in the current Flow Recommendations. Future uses were analyzed in the same manner as existing water uses under the same impact indicators (e.g., completion of NIIP was modeled as a depletion for its full water rights acreage).
- (3) Navajo Dam would be operated as described in the ROD for the Navajo Reservoir Operations FEIS to meet Flow Recommendations to the extent possible. In the Navajo Reservoir Operations FEIS, flow statistics were based on the modeled period of 1929–93 compared to the Flow Recommendations criteria, and Navajo Dam operations were adjusted until the Flow Recommendations could be met. The inability to implement the SJRBRIP was considered to be an impact to the endangered fish. Under the SJRPNM Alternative, all but two of the flow criteria are met for the worst-case scenario, and these criteria have been

determined by the Biology Committee to be ineffective in accomplishing the anticipated results (Miller, 2005). The 2,500 cfs criteria are missed by about 12 percent for 3 days in 1 year out of the 65-year period, or 0.01 percent of the time. All other Flow Recommendations are fully met. The U.S. Fish and Wildlife Service (Service) determined in its biological opinion (volume II, appendix C, part III) that “this reduction is not expected to have a measurable adverse effect for the endangered fish or their designated critical habitat and would not preclude recovery.”

- (4) The following projects and uses would not be adversely impacted by the SJRPNM Alternative: (1) Colorado Ute and Navajo Indian water uses pursuant to the 1988 Colorado Ute Settlement Act and the 2000 Settlement Act amendments (which also authorize the ALP Project and its component NNMP); (2) Jicarilla Apache Nation water uses pursuant to the Jicarilla Settlement Act; and (3) the completion of the NIIP.
- (5) The SJRPNM Alternative is compatible with the Upper Basin States’ ability to develop and use their compact apportionment. The use of Upper Basin water in the Lower Basin (Gallup/Window Rock areas) is also considered compatible. Therefore, no impact is predicted.

NIIP Amarillo Alternative.—Navajo Reservoir elevations for the NIIP Amarillo Alternative would generally be lower than those for the SJRPNM Alternative (0.9-foot increase) because of withdrawals made from Navajo Reservoir via the existing NIIP intake structure to meet the full amount of project demands (table V-4). The proposed project is designed to divert a total of 37,764 AFY from the San Juan River with a resulting depletion of 35,893 AFY based on the 2040 project population with a demand rate of 160 gpcd. A total of 37,764 acre-feet would be diverted through the existing NIIP facilities at Navajo Reservoir to Cutter Reservoir and a newly constructed 4,500 acre-foot active storage reservoir via the NIIP Amarillo Canal to meet project water demands.

A combination of natural flows and releases from Navajo Reservoir would be used to meet existing downstream senior water rights and Flow Recommendations. Mean average flows in the San Juan River would decrease by 1.4 cfs to meet project demands.

The application of the evaluations criteria for the NIIP Amarillo Alternative result in the same conclusions as those for the SJRPNM Alternative, with no adverse impacts identified.

Water Uses and Resources – Mitigation Measures

As part of the proposed project, the Navajo Nation provides a depletion guarantee to allow for full project development while not exceeding the existing depletion baseline (table V-3) or limiting the implementation of the SJRBRIP.

Reclamation would track actual depletions for the NIIP and ALP Project through the 5-year consumptive use and loss reporting. When the sum of depletions for the NIIP and ALP Project reach a 290,000 acre-foot yearly average, more detailed accounting will be required. Additional detail on the Navajo Depletion Guarantee is included in Chapter VI – Environmental Commitments and Mitigation Measures.

Water Resources and Uses – Summary of Impacts

Under the No Action Alternative, existing and future water uses and projects with valid water rights and environmental clearances would continue to be constructed and/or operated and the elements of the SJRBRIP would continue to be implemented. The SJRPNM and NIIP Amarillo Alternatives (including the Navajo Depletion Guarantee, described in chapter VI) would result in missing the 2,500 cfs Flow Recommendation criteria 0.01 percent of the time.⁶ The Service determined that this reduction is not expected to have a measurable effect on the endangered fish or their critical habitat.

Mean reservoir elevations would slightly increase under both action alternatives, but this change is not significant. Mean average San Juan River flows would increase by 4.6 cfs under the SJRPNM Alternative and decrease by 1.2 cfs under the NIIP Amarillo Alternative. The benefits of other resources from increased flows and reservoir elevations are discussed in greater detail for each resource in the sections of this chapter (Aquatic Resources, Vegetation Resources, Recreation Resources, and others).

Indian Trust Assets

This section addresses the potential impacts to ITAs that could result from implementation of the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action and action alternatives affect ITAs?

Overview

Scope

The scope includes ITAs associated with Navajo Reservoir and the San Juan River and on surrounding trust/reservation lands of the Navajo and Jicarilla Apache Nations.

⁶ This assumes the SJRPNM and NIIP Amarillo Alternatives' depletions would be 20,782 AFY, respectively, with the Navajo Depletion Guarantee.

Impact Indicators

An impact is considered to exist for any action that would:

- Adversely affect the value, use, or enjoyment of an ITA
 - Disregard or subordinate the government-to-government relationship that exists between the United States and any affected Tribal Nation
-

Indian Trust Assets – Affected Environment

Introduction.—The United States has a trust responsibility to protect rights reserved by or granted to Indian Tribes by treaty, statutes, and Executive orders. This trust responsibility requires that Federal agencies such as Reclamation take actions reasonably necessary to protect ITAs. Interior Secretarial Order Number 3215, dated April 28, 2000, further states:

The proper discharge of the Secretary's trust responsibility requires, without limitation, that the Trustee, with a high degree of care, skill, and loyalty: Protect and preserve Indian Trust Assets from loss, damage, unlawful alienation, waste, and depletion.

Reclamation ITA policy states that Reclamation will carry on its activities in a manner that protects ITAs and avoids adverse impacts to ITAs when possible. When Reclamation cannot avoid adverse impacts, it will provide appropriate mitigation or compensation (Reclamation, 1994 and 1998).

A basic description of ITAs is as follows:

- ITAs are legal interests in assets held in trust by the Federal Government for federally recognized Indian Tribes or Nations.
- Assets are anything owned that has monetary value. The assets need not be owned outright, but could be some other type of property interest, such as a lease or a right to use something. Assets can be real property, physical assets, or intangible property rights.
- A trust has three components: the trustee, the beneficiary, and the trust asset(s). The beneficiary is also sometimes referred to as the beneficial owner of the trust asset. In this trust relationship, title to ITAs is held by the United States (trustee) for the benefit of a Tribal Nation.

- Legal interest means there is a property interest for which a legal remedy, such as compensation or an injunction, may be obtained if there is improper interference.
- ITAs do not include things in which a Tribal Nation has no legal interest (e.g., off-reservation sacred sites in which a Tribe has no legal property interest are generally not considered ITAs).
- ITAs cannot be sold, leased, or otherwise alienated without the United States' approval. While most ITAs are located on the reservation, they also can be located off-reservation. Examples include lands, minerals, water rights, hunting and fishing rights, other natural resources, money, or claims.

Letters requesting identification and consultation on ITA issues were sent to 24 Tribal governments. Potential ITAs were identified for four federally recognized Tribes within the Basin: the Navajo and Jicarilla Apache Nations, the Ute Mountain Ute Tribe, and the Southern Ute Indian Tribe. During these consultations, Reclamation concluded that ITAs potentially affected by the proposed Federal action were limited to water rights and land use (easements, including Trust lands and Tribal allotments, necessary for project construction and operation). The proposed action is not expected to affect any treaty-based fishing, hunting or gathering, or similar rights of access use on traditional Tribal lands.

In *Winters v. United States*, the U.S. Supreme Court laid the foundation for Indian water rights that have become known as Winters Doctrine rights. The court held that the establishment of an Indian reservation carries with it an implied amount of water necessary to satisfy the purposes of the reservation. A water right granted to a Tribal Nation under the Winters Doctrine is given a priority date no later than the time when the reservation was established and, unlike water rights permitted, licensed, or adjudicated under State statutes, such rights under the Winters Doctrine cannot be lost through non-use.

Native American Graves Protection and Repatriation Act of 1990 (NAGPRA)⁷ cultural items and other cultural property may be considered ITAs by association with land status, treaty, or some other statute, but are not considered ITAs by virtue of NAGPRA alone. Therefore, cultural resource issues and mitigation, including sacred sites and NAGPRA issues, are addressed separately in the “Cultural Resources” section in this chapter.

Approximately 60 percent of the land within the Basin is entrusted to the reservation lands of the Navajo and Jicarilla Apache Nations, Southern Ute Indian Tribe, and Ute Mountain Ute Tribe. Winters Doctrine water right settlements in the San Juan River

⁷ A Federal law, passed in 1990, that provides a process for museums and Federal agencies to return such Native American cultural items as human remains, funerary objects, sacred objects, and objects of cultural patrimony to lineal descendants, culturally affiliated Indian Tribes, and Native Hawaiian organizations.

Basin have been negotiated and finalized for the Jicarilla Apache Nation, Ute Mountain Ute, and Southern Ute Indian Tribes. Not all reserved water rights under the Winters Doctrine for the Navajo Nation have been quantified or settled; however, P.L. 111-11 authorizes the Secretary to execute an agreement consistent with the provision of the act that settles the Nation's San Juan River Basin reserved water claims in New Mexico. Existing and future Tribal uses of San Juan River water are shown in table V-5. A discussion of the affected environment for each Tribe and Tribal allotments follows.

Navajo Nation.—The affected environment for this analysis includes much of the eastern and northern portions of the Navajo Nation (where adequate domestic water service is lacking); the lands within the NIIP service area; lands served along the Hogback, Fruitland-Cambridge, and Cudei irrigation projects; irrigation along the tributaries to the San Juan River; and 43 Navajo chapters (communities) within the proposed project service area discussed previously in chapter II.

The Navajo Indian Reservation was established by treaty in 1868 (15 Stat. 667) and was expanded by Executive orders and statutes between 1868 and 1934. The Navajo Nation lands total approximately 26,897 square miles and extend into New Mexico, Arizona, and Utah. The San Juan River runs through the original 1868 reservation, is a major source of water for Navajo Nation agricultural and domestic use, and is the only water source in the northern portion of the reservation capable of being readily developed. Basin water also is used for Tribal mineral development such as the Navajo Mine and production of coal-bed methane. About one-half of all Navajo Nation lands lie within the Basin.

The Navajo Nation has substantial water rights in the Basin, based on historical use and reserved water rights (Winters Doctrine rights); however, as mentioned previously, not all reserved rights have been quantified through settlement or litigation. The Navajo Nation claims a priority date of no later than 1849 for its water rights, based on the treaty with the United States in that year (Interior, 2000a), even though the reservation was not established until 1868. Because significant areas of arable Navajo Nation lands lie within the Basin, the Navajo Nation claims a significant amount of the water in the San Juan River. This is based on the practicably irrigable acreage (PIA) standard enunciated in the Supreme Court case of *Arizona v. California*. The ultimate amount of the Navajo Nation's water rights in the Basin in Arizona and Utah, including diversion and use of water from the San Juan River, may depend either on PIA analyses to be prepared by the BIA and litigation of the Nation's claims in water rights adjudications, or on the negotiation of water rights settlements between the Navajo Nation and each of the States. The Navajo Settlement Agreement, approved by the Congress, quantifies the Navajo Nation's water rights in the Basin within the State of New Mexico. The proposed project is a key component of the proposed Navajo Settlement Agreement, included in P.L. 111-11. P.L. 111-11 requires the Secretary to execute an agreement consistent with the provisions of the act by December 31, 2010, and to complete project construction by 2024.

Table V-5.—Summary of major existing and future Tribal uses of Basin water

Description	Diversion (AFY)	Depletion (AFY)	Included in environmental baseline ¹ for recent ESA consultations
Existing uses – Navajo Nation²			
NIIP (Blocks 1–8) ³		149,420	Yes
Hogback Project		12,100	Yes
Cudei Irrigation Project		900	Yes
Fruitland		7,898	Yes
Existing uses – Navajo Nation (New Mexico State water rights)			
Shiprock Helium Plant (permit 2472)		1,400	Yes
Kerr McGee (uranium processing) (permit 2875)		700	Yes
Kerr McGee (permit 2807)		500	Yes
Navajo Methodist School (Navajo Academy)		139.5	Yes
Existing uses – Jicarilla Apache Nation			
Decreed for historic and existing uses, 1880 priority date	5,683	2,195	Yes
Small third-party water service contracts	770	⁴ 770	Yes
PNM third-party water service contract (pursuant to the 1992 Jicarilla Settlement Act)	16,200	16,200	Yes
Evaporation – stock ponds and reservoirs		2,187	Yes
Existing uses – Ute Mountain Ute Tribe			
Dolores Project	25,100		N/A ⁵
Existing uses – Southern Ute Indian Tribe			
Water allocated to the Tribe from the Florida Project	2,000		Yes
Pine River 181.7 cfs and 1/6 interest in Vallecito Reservoir			Yes
San Juan River, 5.64 cfs direct diversion rights, 1868 priority date	1,014		Yes
Piedra River, 2.0 cfs direct diversion, 1868 priority date	600		Yes

Table V-5.—Summary of major existing and future Tribal uses of Basin water (continued)

Description	Diversion (AFY)	Depletion (AFY)	Included in environmental baseline ¹ for recent ESA consultations
Future uses – Navajo Nation¹			
Navajo Nation Municipal Pipeline (ALP Project)	4,680	2,340	Yes
NIIP (Blocks 9–11)		120,600	Yes
Navajo-Gallup Water Supply Project (includes 7,500 AFY for the city of Gallup)	37,764	² 27,193	No
Hogback Project restoration		16,420	No
Future uses – Jicarilla Apache Nation			
Jicarilla Settlement Act of 1992 (from San Juan-Chama Project)	6,500	6,500	Yes
Jicarilla Apache Nation Navajo River Water Supply Project (Navajo-Gallup)	⁶ 12,000	6,654	Yes
Water Rights Settlement Act of 1992 (Remaining from Navajo Reservoir or Navajo River) (Navajo-Gallup)	⁶ 4,530	1,876	No
Future uses – Ute Mountain Ute Tribe (see table I-1, ALP FSEIS for details on Colorado Ute Settlement)			
ALP Project		16,525	Yes
San Juan River, 10 cfs direct diversion rights, 1868 priority date	1,600		No
Mancos River direct diversion rights for 7,200 acres, priority date subordinated to 1985	21,000		No
Navajo Wash, 15 cfs direct diversion rights, priority date subordinated to 1985	4,800		No
Tributary groundwater, domestic and livestock wells		1,850	No

Table V-5.—Summary of major existing and future Tribal uses of Basin water (continued)

Description	Diversion (AFY)	Depletion (AFY)	Included in environmental baseline ¹ for recent ESA consultations
Future uses – Southern Ute Indian Tribe (see table I-1, ALP FSEIS, p. 1-6 for details on Colorado Ute Settlement)			
ALP Project		16,525	Yes
Florida River, direct diversion rights, priority date subordinated to 1976	1,090		No
Florida River, Project water	563		Yes
Stollsteimer Creek, 1,850 AFY Pargin Reservoir storage, 5.5 cfs with 1868 priority and refill right with 1986 priority date	1,850+		Yes ⁷
Piedra River, 8.9 cfs direct diversion, 1868 priority date	1,595		No
Devil Creek, direct flow right, 1868 priority date subordinated to 1976	183		No
San Juan River, direct diversion rights, 1868 priority date	516		No
Round Meadow Creek, direct diversion rights, 1868 priority date	975		No
Cat Creek, direct diversion, 1868 priority date	1,372		No
Tributary groundwater, domestic and livestock wells	2,000		No

Note: Blank spaces indicate information not readily available.

¹ The Service's biological opinions contain a baseline of depletions that are considered in recent ESA consultations. This table is not the same as the depletion table derived for this planning report and final environmental impact statement (table V-3).

² The Navajo Nation has existing unquantified uses in the Basin that are not listed in the table, including municipal water uses, irrigation on San Juan River tributaries, livestock uses, evaporation from reservoirs, and stock ponds, etc. These uses are included in the baseline table (table V-3).

³ Includes 16,420 AFY from Hogback and Hogback extension.

⁴ This 770 acre-foot depletion is allowed under the 3,000 acre-foot minor depletion account allowed for through ESA (section 7) consultation under the SJRBRIP.

⁵ This 25,100 acre-feet is imported from the Dolores River Basin and consumed in the Basin.

⁶ The proposed diversion is a variable amount up to 12,000 AFY. The maximum new diversion will depend on the available water in that year. The Nation, as a member of the Hydrology Committee, will introduce for the Hydrology Committee's consideration, a method to calculate available water. The sum of this diversion and the remaining water Jicarilla Settlement Act water supply will not exceed 16,530 AFY.

⁷ 530.6 acre-feet of the storage right and the 2 cfs and the 3.5 cfs are included in the environmental baseline for recent ESA consultations.

Only the NIIP, the three San Juan River projects in New Mexico (Hogback, Fruitland, and Cudei), and a small project near Aneth, Utah, would potentially be affected by the proposed project because of the Navajo Depletion Guarantee. While production of irrigation tracts or projects on-reservation remain important to the Navajo Nation, it is not currently economically practicable to construct pipelines and pump San Juan River water to the many irrigation tracts or projects scattered throughout Navajo Nation lands.

The SJRPNM and NIIP Amarillo Alternatives would be compatible with existing and planned future Navajo Nation water development projects as well as the Navajo Nation reserved water rights that have not been quantified. Descriptions follow for several of the largest existing and planned Indian water development projects in the Basin; however, the Navajo Nation's water development interests are not limited to these projects (Navajo Nation, 2000a).

Navajo Indian Irrigation Project.—Navajo Reservoir is the principal water storage facility for the NIIP. P.L. 87-483, enacted in 1962, authorized the Secretary to construct, operate, and maintain the NIIP for the purpose of furnishing irrigation water to approximately 110,630 acres. The NIIP, at the time of project authorization, was anticipated to require an average annual diversion of up to 508,000 AFY. The Agreement between the United States and the Navajo Tribe of Indians for Delivery of Water from Navajo Reservoir, executed in 1976, repeats the authorization language from P.L. 87-483, Section 2. However, the diversion amount of 508,000 AFY was the design diversion amount for flood irrigation of 110,630 acres, a large portion of which were to be located west of Chaco Wash and from Shiprock to the north to Newcomb in the south. The NIIP was later reconfigured to:

- (1) Place all the proposed project acreage east of the Chaco River, which greatly reduced the overall canal length and water conveyance losses
- (2) Install pressure sprinkler irrigation, which improved irrigation efficiency
- (3) Reduce farm delivery operations

It is estimated that the redesigned NIIP will require a diversion, on average, of between 337,500 AFY and 372,000 AFY to irrigate 110,630 acres each year, depending on the implementation and success of planned water conservation measures. Also, actual irrigation diversions could be less depending upon land fallowing and farm management practices.

The NIIP includes a water storage and delivery system, lands, roads, utilities, and other facilities for irrigation of project lands located south of Farmington, New Mexico. The Navajo Agricultural Products Industry (NAPI) is a Navajo Nation business enterprise formed in 1970 to develop, farm, operate, and manage the NIIP lands. Both the NIIP and

the NAPI were established to provide a profit and employment to the Navajo people; they currently provide approximately 250 permanent jobs and 800 seasonal jobs.

The NIIP is being developed in 11 separate blocks of approximately 10,000 acres of irrigable land each. The Congress began funding NIIP construction in 1963, and the project began operation in 1976 with the first 10,000-acre block. The project was scheduled for completion in 1986, but funding delays postponed completion. In 2002, facilities to deliver irrigation water to about 65,000 acres in Blocks 1 through 8 were complete. The acreage through Block 8 totals about 76,481 acres. Construction on Blocks 9, 10, and 11 was scheduled to be completed by 2012, with full irrigation acreage to be reached in 2032. This schedule may not be met because of limited congressional funding.

San Juan River Irrigation Projects.—These irrigation projects along the San Juan River were initiated between 1900 and 1937. In 2000, these projects provided irrigation water to about 5,300 acres.

- (1) The *Hogback Irrigation Project* supplies water for lands on the north side of the San Juan River, from the Hogback, located about 9 miles east of Shiprock, New Mexico, to about 17 miles northwest of Shiprock. In recent years, the acreage irrigated under the Hogback Irrigation Project has ranged from an estimated 2,580 acres to about 2,830 acres. In 1991, 16,420 AFY of depletion of the inactive portions of the Hogback Irrigation Project was applied to the NIIP for ESA consultation purposes. Construction of NIIP Blocks 1 through 8 was to proceed while research on endangered fish recovery took place.
- (2) The *Cudei Project* supplies water for lands on the south side of the San Juan River about 6 miles northwest of Shiprock. In recent years, the acreage irrigated under the Cudei Project has ranged from an estimated 290 acres to 390 acres. The Cudei diversion dam was removed in 2002, and supply to the proposed project was provided via a siphon from the Hogback main canal.
- (3) The *Fruitland Irrigation Project* diversion dam and headworks are located 2 miles west of Farmington, New Mexico, on the south bank of the San Juan River. In recent years, the acreage irrigated under the Fruitland Irrigation Project, including Cambridge, has ranged from an estimated 1,950 acres to about 2,140 acres. The Cambridge Irrigation Project is supplied by the Fruitland Irrigation Project, and in 2000, about 60 acres were irrigated in the Cambridge Project area.

Navajo Nation Municipal Pipeline.—The NNMP is authorized as a structural component of the ALP Project under the Colorado Ute Indian Water Rights Settlement Act of 1988, P.L. 100-585, as amended (P.L. 106-554) (Colorado Ute Settlement Act) to augment a

30-year old pipeline that serves almost 60 percent of the current domestic water uses occurring along the San Juan River between Farmington and Shiprock. The pipeline will deliver 4,680 AFY of water diverted from the Animas River to supply a depletion of 2,340 AFY (Reclamation, 2000a).

Other Navajo Nation ITAs.—In addition to water rights, the Navajo Nation Reservation land uses would be affected by the proposed project. These ITAs include Trust lands necessary for the construction and operation and maintenance (O&M) of the proposed project pipelines and associated facilities. The BIA administers these Trust lands for the benefit of the Navajo Nation. Other identified Navajo ITAs include the Navajo Tribal Utility Authority (NTUA) Shiprock Public Water System, other NTUA public water systems, and mineral and coal resources.

Land uses potentially affected would include homesites, grazing assignments, leases, and transportation corridors administered by the local Navajo chapters and the BIA. The proposed project has the potential to temporarily affect up to 32,686 acres and permanently affect 249 acres of Navajo Nation Trust Lands (assuming an area of disturbance of 500 feet from the centerline on each side of the proposed pipeline project during construction, a 100-foot right-of way needed for O&M of the pipeline and placement of permanent project facilities). These impacts are discussed in greater detail in the “Vegetation Resources” and “Land Use” sections of this chapter.

Jicarilla Apache Nation.—The Jicarilla Apache Indian Reservation was created by a series of Executive orders between 1874 and 1908. The reservation covers about 880,000 acres in north-central New Mexico. The reservation lies in both Rio Arriba and Sandoval Counties and includes 137,150 acres of land purchased by the Apache Nation. About 80 percent of the reservation is on the west side of the Continental Divide in the Basin. The western boundary of the reservation is about 15 miles east of Navajo Reservoir. The Navajo River, which is tributary to the San Juan River, is a perennial stream on the reservation. The San Juan-Chama Project⁸ diverts approximately 50 percent of the average annual flow of the Navajo River upstream of the Jicarilla Apache Reservation. Downstream from the reservation, Navajo Reservoir impounds the water. The Jicarilla Apache Nation was not included initially as a beneficiary of either of these Federal water resource development projects.

Settlement negotiations between the Jicarilla Apache Nation and the United States began in 1985. Central to the negotiation effort was an updated hydrology study that resulted in the Secretary submitting to the Congress a 1988 Hydrologic Determination for the Upper

⁸ For a full description of the San Juan-Chama Project, see the “Connected, Cumulative, and Related Actions” section of this chapter.

Colorado River Basin. According to the hydrologic determination, water was available within New Mexico's Upper Basin apportionment for development and settlement of the Jicarilla Apache Nation's Federal reserved water right claims.

In October 1992, the Jicarilla Settlement Act became law (160 Stat. 2237). The water delivery provisions for future uses in the settlement act mandated certain requirements to be fulfilled before water could be made available for Tribal use. All of these requirements were met, and on February 23, 1999, the Jicarilla Apache Nation water rights in the San Juan River were adjudicated in District Court, San Juan County, New Mexico.

As part of the Jicarilla Settlement Act, the Congress approved a settlement contract between the Nation and the Secretary to provide for the diversion by the Nation of 33,500 AFY, with a corresponding depletion of 25,500 AFY, from the Navajo Reservoir water supply at or above the reservoir, and to provide for the delivery to the Nation of 6,500 AFY at Heron Reservoir through the San Juan-Chama Project as part of the proposed project's yield. Water to be supplied under the contract with the Secretary is the same priority as the water rights for Navajo Reservoir and the NIIP and must share shortages with other contractors of the Navajo Reservoir supply, including the NIIP. The Jicarilla Settlement Act also allows the Jicarilla Apache Nation to market its Navajo Reservoir supply and San Juan-Chama Project water through third-party contracts, consistent with Federal and State laws. Consistent with the Jicarilla Settlement Act, Interior works with the Jicarilla Apache Nation to facilitate use of water pursuant to the settlement contract and subcontracts between the Jicarilla Apache Nation and third parties that have been approved by the Secretary.

Under the partial final decree in the San Juan River adjudication, the Jicarilla Apache Nation has a reserved water right for historic and existing uses not to exceed an annual diversion of 5,683 AFY or the quantity necessary to supply a depletion of 2,195 acre-feet, whichever is less, and a net evaporation of 2,187 acre-feet. These water rights retain a priority date of 1880.

A variety of development options for these water rights is being pursued by the Jicarilla Apache Nation, including third-party water leases and on-reservation water use. The Jicarilla Apache Nation has leased water to several small contractors and to the PNM. In 2006, the PNM third-party subcontract began putting to beneficial consumptive use up to 16,200 AFY of the Jicarilla Apache Nation's Navajo Reservoir supply contract water. The Jicarilla Apache Nation is also pursuing use of its remaining portion of the 25,500 AFY of depletion from the Navajo Reservoir water supply, including possible implementation of the Jicarilla Apache Nation Navajo River Water Supply Project (JANNRWSP) that would result in a consumptive use of up to 6,654 AFY. For this analysis, it was assumed that the Jicarilla Apache Nation would not use its Navajo Reservoir supply contract to implement the JANNRWSP and that the Nation would instead make available 8,530 AFY of depletion from its Navajo Reservoir supply contract

water and 170 AFY of depletion from some of its historic use reserved rights that currently are not used to supply the uses of water to be made under the proposed project by both the Jicarilla Apache Nation (1,200 AFY) and the city of Gallup (7,500 AFY). For purposes of this analysis, it is assumed that the JANNRWSP would divert no future use water, 2,020 AFY of depletion of the historical water right would be used for other purposes, and 8,700 acre-feet would be delivered to this project (6,570 acre-feet previously committed to JANNRWSP plus 1,960 acre-feet of additional future use water and 170 acre-feet of other water) to meet the full demands anticipated from the Jicarilla Apache Nation water rights.

Colorado Ute Indian Tribes.—The original Ute Indian Reservations were carved out of the historical Ute homelands in 1868. The present lands of the Ute Mountain Ute and Southern Ute Indian Tribes are in southwestern Colorado and northwestern New Mexico. The Ute Mountain Ute lands include 890 square miles in Colorado and New Mexico. Southern Ute Indian Trust Lands include 470 square miles within the Tribe’s 1,250 square miles of checkerboard reservation. Seven rivers in southwestern Colorado flow through the Southern Ute and Ute Mountain Ute Reservations. The Colorado Ute Indian Water Rights Final Settlement Agreement was signed on December 10, 1986, and quantified the Colorado Ute Tribes’ water rights in the San Juan and Dolores River Basins in the State of Colorado.

A large portion of the Colorado Ute Settlement Act is being implemented by the Ute Mountain Ute Tribe through the participation in the Dolores Project and by the Ute Mountain Ute and Southern Ute Indian Tribes’ participating in the ALP Project; however, these two projects do not fully implement the act. The Tribes also have water rights in other rivers that do not involve the Dolores or ALP Projects; they are presently using the other rights or have plans to use them. (Future use water rights granted under the act were provided in table V-5). Collectively, the Colorado Ute Tribes have approximately up to 36,104 acre-feet of future use direct diversion and groundwater that may not be included in the existing ESA baseline. Additional section 7 consultations may be necessary if a Federal nexus exists for the development of these water rights.

Tribal Allotments.—In 1887, the Congress passed the General Allotment Act (24 Stat. 388, ch. 119, 25 USCA 331). The allotment act was applied to reservations by the President whenever, in his opinion, it was advantageous for particular Indian Tribes. Members of the selected Tribe or reservation were given permission to select pieces of land—usually around 40 to 160 acres in size—for themselves and their children. If the amount of reservation land exceeded the amount for allotment, the Federal Government could negotiate to purchase the land from the Tribes and then sell it to non-Tribal settlers. Sixty million acres were either ceded outright or sold to non-Indian homesteaders and corporations as “surplus lands.” Under the General Allotment Act, Indians had only partial ownership because the United States considered itself to have legal title to the land.

In 1934, the Howard-Wheeler Act, also known as the Indian Reorganization Act (48 Stat. 984), prohibited further allotment of Indian lands; extended periods of trust and restrictions on allotted lands; authorized the Secretary to restore Tribal ownership to the remaining surplus lands of an Indian reservation; prohibited transfers of restricted Indian land, individually owned or otherwise, except to an Indian Tribe; and authorized the acquisition of lands, water rights, surface rights, and interest by the U.S. Government for Indians and declares that purchased lands be tax exempt.

Indian Trust Assets – Methodology

Much of the ITA analysis was based on the review of documents concerning potentially impacted ITAs, with a focus on water rights. These documents include the Jicarilla Settlement Act; Colorado Ute Settlement Act; Secretarial Orders 3175 and 3206; various Interior and Reclamation guidelines and procedures; and available economic development, water development, and natural resource management plans for the Navajo and Jicarilla Apache Nations; Act of June 13, 1962, authorizing the construction and O&M of the NIIP and the initial stage of the San-Juan Chama Project as Colorado River Storage Project (CRSP) participating projects; the 2000 Final Supplement to the Environmental Impact Statement for the ALP Project; and the Navajo Reservoir Operations FEIS (Reclamation, 2006) for Navajo Reservoir Operations. Correspondence between the Tribal Nations and Reclamation concerning ITAs were also reviewed.

In addition, Reclamation held meetings with Tribal representatives to obtain their interpretations and assessments of ITAs that could be affected by the proposed Federal action. The Navajo and Jicarilla Apache Nations and BIA are active members of the project planning report's steering committee and are cooperating agencies in the development of this planning report and final environmental impact statement (PR/FEIS). Information about project issues was obtained from the Navajo Nation's Department of Water Resources, Navajo Fish and Wildlife Department (NFWD), Jicarilla Apache Nation's Water Commission, and the Jicarilla Apache Department of Natural Resources. Additional consultation between Reclamation and the Southern Ute Indian Tribe also occurred.

Indian Trust Assets – Impacts Analysis

Reclamation sent letters to the following 24 Tribal governments requesting assistance in identifying potentially affected ITAs: all Pueblos, Ute Mountain Ute, Southern Ute Indian Tribe, Navajo Nation, Jicarilla Apache Nation, and Hopi Tribe. Reclamation received responses back from the Hopi Tribe, Navajo Nation, Jicarilla Apache Nation, and Southern Ute Indian Tribe. Consultations with potentially affected Indian Tribes have been completed. Copies of Tribal comment letters are included in volume III. Consultation between Reclamation and the Southern Ute Indian Tribe focused on

Southern Ute water rights included within the existing environmental baseline. Reclamation concluded that the information presented in table V-5 represents current Tribal water rights included in recent ESA consultations. The SJRBRIP is intended to provide ESA coverage for future Tribal projects with a Federal nexus not included in recent ESA consultations as described in the SJRBRIP principles ESA section 7 consultations document (attachment O).

SJRPNM Alternative.—Depletions associated with the SJRPNM Alternative added to the existing ESA baseline depletions (table V-3) exceed the ability of Navajo Reservoir to meet current Flow Recommendations. The Navajo Nation developed a Navajo Depletion Guarantee that would keep the proposed project from impacting the current Flow Recommendations and allow full project development within the existing ESA baseline. With the Navajo Depletion Guarantee, the proposed project meets the critical elements of the Flow Recommendations.

The Navajo Nation depletion of 27,193 AFY would be allocated between New Mexico and Arizona. Water rights settlement negotiations are underway in both New Mexico and Arizona to determine the quantity of water available for the proposed project among other uses. The Navajo Settlement Agreement would, when executed by the Secretary under P.L. 111-11, provide the Navajo Nation the right to consumptively use up to 20,782 acre-feet in any year for its uses under the proposed project with the State of New Mexico, and it is anticipated that water rights in Arizona will be made available to permit the Navajo Nation to consumptively use up to 6,411 acre-feet in any year for its uses under the proposed project within the State of Arizona and within the allocations of water made to the State of Arizona by compact or decree. Separate Navajo Reservoir water supply contracts with the Secretary will be needed for the delivery of water from Navajo Reservoir and the San Juan River to the Navajo Nation's project uses in New Mexico and Arizona.

Navajo Nation vegetation and land use resources associated with the SJRPNM Alternative are discussed in greater detail under the appropriate resource. Easements for pipelines through Tribal allotments would be acquired through the BIA and negotiated on an individual basis.

The 1,200 acre-foot demand for the Jicarilla Apache Nation would be met by delivery of a portion of their 25,500 acre-foot contract allocation from the Navajo Reservoir water supply as a result of the Jicarilla Settlement Act or a portion of their unused historical rights. Contingent upon successful negotiation of a subcontract between the Jicarilla Apache Nation and the city of Gallup, the 7,500 acre-foot demand for the city would be met with deliveries of the Navajo Reservoir water supply subcontracted from the Jicarilla Apache Nation to the city. The Secretary would need to approve the subcontract.

Approximately 36,104 acre-feet of Tribal future use water may not be included in the existing environmental baseline. Additional depletions over and above the proposed

project may result in violations of critical elements of the Flow Recommendations. Tribal water developments that include a Federal nexus would require additional ESA section 7 consultation. The SJRBRIP is intended to serve as the RPA for actions that may cause jeopardy to the endangered fish. Additional information on the SJRBRIP is provided in chapter I.

NIIP Amarillo Alternative.—Impacts to ITAs under the NIIP Amarillo Alternative would be similar to those described for the SJRPNM Alternative. Vegetation and land use impacts associated with the NIIP Amarillo Alternative are discussed in greater detail under the appropriate resource.

Indian Trust Assets – Mitigation Measures

No mitigation measures are proposed.

Indian Trust Assets – Summary of Impacts

The SJRPNM and NIIP Amarillo Alternatives would provide needed domestic water supplies for both the Navajo and Jicarilla Apache Nations. Implementation of these alternatives may make it more difficult for the Colorado Ute Tribes to obtain non-jeopardy biological opinions to develop future use water rights (see table V-3) without reliance on implementation of the SJRBRIP. The SJRBRIP is intended to serve as the RPA to avoid jeopardy for future water development.

Water Quality

This section discusses the potential impacts to water quality that could result from operation of the alternatives considered and associated operation of Navajo Dam and Reservoir.

Issue: How would the No Action and action alternatives affect water quality and the attainment of water quality standards?

Overview

Scope

Navajo Reservoir and the San Juan River to Lake Powell.

Impact Indicators

Exceedences of Federal, State, and Tribal water quality standards were considered an adverse impact.

Water Quality – Affected Environment

The San Juan River is characterized by good water quality when flows are released from Navajo Dam, but water quality progressively degrades downstream due to natural and induced bank erosion, diversions, agricultural and municipal use, and tributary contributions. The State of New Mexico has listed reaches of the San Juan River where water quality does not meet intended uses. Turbidity, fecal coliform, and bottom sediments impact the designated uses of the river most often. Several trace elements (selenium, aluminum, arsenic, mercury, copper, and zinc) have occasionally exceeded State standards from Navajo Dam to Farmington, New Mexico (Reclamation, 2000a).

San Juan River water quality generally declines to Shiprock, New Mexico, with the stretch of the river between Farmington and Shiprock having the highest number of water quality standard exceedences. At the Four Corners gauge/sampling site, water quality improves and the number of exceedences decreases, but water quality declines again from Four Corners to Mexican Hat, Utah (Reclamation, 2000a).

The State of New Mexico has issued fish consumption advisories because of elevated mercury concentrations in fish from Navajo Reservoir and the San Juan River from Hammond diversion to the mouth of the Mancos River.

A number of facilities (city waste water treatment plants and powerplants) have National Pollution Discharge Elimination System (NPDES) discharge permits along the San Juan River. These permits are based on critical low-flow values determined from flow in the river where they discharge.

*Previous Water Quality Studies*⁹.—The water quality impacts analysis included extensive water quality studies that have been conducted on the San Juan River and its tributaries within the last 10 years. The U.S. Geological Survey (USGS) has conducted studies under Interior’s National Irrigation Water Quality Project (Blanchard et al., 1993; Thomas et al., 1998). The SJRBRIP was initiated in October 1991 and has been

⁹ The discussion is a brief summary of the detailed results produced by the studies in question. The summaries are general in nature, and the reports should be read for detailed analysis of the findings.

collecting data on water quality on the San Juan River ever since. In addition, water quality data were collected and analyzed as part of the NIIP environmental studies on the San Juan River main stem as well as on tributaries, seeps, springs, ponds, and wells on the proposed project lands. Table V-6 is a summary of historical water quality data collected on the San Juan River at the USGS gauging stations.

Early USGS investigations (Blanchard et al., 1993) were reconnaissance-level studies to identify whether irrigation drainage (1) has caused or had the potential to cause adverse harmful effects to human health, fish, and wildlife or (2) may adversely affect the suitability of water for other beneficial uses in the Basin. It concluded that selenium was the major trace element of concern in all sampled media (water, bottom sediments, and biota). The USGS performed a detailed study of selenium and selected constituents in water, bottom sediments, soil, and biota associated with irrigation drainage in the San Juan River area (Thomas et al., 1998). Selenium was much less concentrated in water at irrigation-drainage sites and ponds on irrigated land; and least concentrated at irrigation-supply sites, backwater, and San Juan River sites. Other elevated trace elements in water, bottom sediments, soils, or biota included lead, molybdenum, strontium, zinc, vanadium, barium, cadmium, chromium, iron, mercury, and aluminum.

Selenium was much more concentrated in water samples than in bottom sediment, soil, or biota samples. Mean selenium concentrations in water samples were greatest from seeps and tributaries draining irrigated lands. The NIIP biological assessment (BIA, 1999) assessed the impacts from full development of the NIIP. The “Water Quality Impacts Analysis” section concluded that the proposed project will increase arsenic, copper, selenium, and zinc levels in the San Juan River. It was concluded that levels of arsenic and zinc concentrations would be below levels of concern for the two endangered fish species. Conclusions on copper were less certain but are not expected to impact the two endangered fish species.

Selenium received a low hazard potential, but uncertainty about actual levels in biota downstream from the proposed project and chronic toxicity to the razorback sucker leaves the possibility of some impact to the recovery of the species. The Navajo Nation developed water quality regulations in 1999.¹⁰ The predicted arsenic, copper, selenium, and zinc levels in the biological assessment are below the Navajo Nation water quality standards. The predicted dissolved selenium level is 1.9 micrograms per liter ($\mu\text{g/L}$), while the standard for total selenium is 2.0 $\mu\text{g/L}$ in the San Juan River. The NIIP biological assessment assumed that the minimum release rate from Navajo Reservoir would be 250 cfs in the future.

¹⁰ The Navajo Nation water quality standards were approved by the Environmental Protection Agency in March 2006.

Table V-6.—Historical (1950–98) water quality measurements on the San Juan River

Parameter	Farmington		Shiprock		Four Corners		Bluff	
	n	Mean	n	Mean	n	Mean	n	Mean
Alkalinity total (mg/L as CaCO ₃)	607	114	646	119	59	121	2,333	147
Aluminum dissolved (µg/L as Al)	34	34.4	138	58.5	40	63.9	174	64.1
Aluminum total (µg/L as Al)	30	5,283	83	15,636	30	11,373	134	20,500
Arsenic dissolved (µg/L as As)	76	1.9	267	2.3	78	1.8	345	1.9
Arsenic total (µg/L as As)	78	2.8	224	4.4	72	3.8	309	4.3
Boron dissolved (µg/L as B)	315	49.5	678	103.9	45	126.0	1,720	68.7
Cadmium dissolved (µg/L as Cd)	11	0.8	71	0.9	15	1.2	56	1.0
Cadmium total (µg/L as Cd)	12	5.7	29	3.6	7	3.7	15	3.7
Calcium dissolved (mg/L as Ca)	859	61.6	1,178	72.4	135	65.6	2,627	93.8
Calcium total (mg/L as Ca)	5	71.5	12	70.8	6	78.8	23	88.8
Chloride total in water (mg/L)	830	9.8	1,084	16.9	104	13.5	2,568	20.6
Chromium dissolved (µg/L as Cr)	4	11.3	53	3.2	4	2.9	48	2.5
Chromium total (µg/L as Cr)	9	51.8	25	22.5	5	17.0	17	52.1
Cobalt dissolved (µg/L as Co)	9	1.5	67	1.4	10	1.6	53	1.5
Cobalt total (µg/L as Co)	13	44.4	29	22.9	7	10.6	21	41.7
Copper dissolved (µg/L as Cu)	45	3.8	165	4.2	48	5.0	203	4.9
Copper total (µg/L as Cu)	45	29.5	121	35.5	42	20.8	163	35.8
Fecal coliform (counts/100 mL)	93	10,588	162	1,040	23	256	72	185
Hardness calc. (mg/L as CaCO ₃)	859	189	1,154	237	123	222	2589	326
Hardness total (mg/L as CaCO ₃)	824	189	969	245	45	224	2423	336
Iron dissolved (µg/L as Fe)	164	47.2	251	31.2	42	22.0	69	30.5
Iron total (µg/L as Fe)	15	25,691	39	30,449	13	13,405	201	4,809
Lead dissolved (µg/L as Pb)	67	0.7	256	1.5	70	0.8	343	1.0
Lead total (µg/L as Pb)	79	30.3	222	27.6	71	23.6	305	26.1
Magnesium dissolved (mg/L as Mg)	859	8.4	1,176	13.4	135	14.4	2,628	25.0
Magnesium total (mg/L as Mg)	5	11.9	12	14.0	6	17.4	23	27.1
Manganese dissolved (µg/L as Mn)	26	22.3	110	45.0	30	6.3	86	6.1

Table V-6.—Historical (1950–98) water quality measurements on the San Juan River (continued)

Parameter	Farmington		Shiprock		Four Corners		Bluff	
	n	Mean	n	Mean	n	Mean	n	Mean
Manganese total (µg/L as Mn)	20	852	56	978	27	449	39	1,109
Mercury dissolved (µg/L as Hg)	70	0.12	254	0.13	75	0.10	338	0.11
Mercury total (µg/L as Hg)	78	0.14	225	0.15	71	0.13	309	0.14
Nickel dissolved (µg/L as Ni)	28	6.1	146	4.6	36	5.2	184	4.6
Nickel total (µg/L as Ni)	28	6.8	105	12.1	39	9.7	144	15.5
Nitrite + nitrate total (mg/L as N)	47	0.27	98	0.39	27	0.74	55	0.78
Oxygen dissolved (mg/L)	251	9.5	455	9.8	159	9.5	478	9.2
pH lab (standard units)	879	7.81	1,097	7.89	107	8.25	1,357	7.78
pH field (standard units)	60	8.13	190	8.26	60	8.25	285	8.20
Phosphorus total (mg/L as P)	59	0.27	164	0.32	31	0.37	95	0.58
Residue total filtrable (dried at 180 °C) (mg/L)	374	382	667	498	102	422	1,313	656
Selenium dissolved (µg/L as Se)	81	0.6	277	1.0	78	1.3	349	1.1
Selenium total (µg/L as Se)	76	0.7	227	0.9	71	1.6	309	1.4
Selenium total recoverable (µg/L as Se)	10	0.5	29	1.0	10	0.9	47	0.8
Silver dissolved (µg/L as Ag)	2	0.75	51	0.56	n/a	n/a	45	0.56
Silver total (µg/L as Ag)	2	0.75	10	1.10	n/a	n/a	9	2.06
Sodium dissolved (mg/L as Na)	836	44.7	951	64.6	112	49.3	2,047	79.2
Sodium total (mg/L as Na)	5	37.7	12	38.5	6	43.8	23	58.2
Solids susp.-residue on evaporation at 180 °C (mg/L)	59	242	191	956	60	663	283	934
Specific conductance (µmhos/cm at 25 °C)	905	550	1136	716	112	644	2,020	931
Sulfate total (mg/L as SO ₄)	827	154	1,083	225	104	193	2,568	329
Turbidity (NTU, FTU, JTU)	117	158	142	527	104	406	92	503
Water temperature (°C)	60	10.6	227	12.2	79	12.4	343	12.6
Zinc dissolved (µg/L as Zn)	80	9.2	268	9.2	77	7.8	346	15.7
Zinc total (µg/L as Zn)	75	92.9	224	114.1	71	204.0	306	109.6

Source: Final Supplemental Environmental Impact Statement, Animas-La Plata Project, Technical Appendices, Water Quality Analysis (, 2000a).

The SJRBRIP study on environmental contaminants in aquatic plants, invertebrates, and fishes of the San Juan River main stem was completed in 1999. The trace elements evaluated included aluminum, arsenic, copper, selenium, and zinc. Aluminum appeared to be related to sediment geochemistry, and most life forms associated with sediment had elevated levels. Arsenic levels showed no consistent pattern for any river reach or site. Elevated arsenic levels were found in most plants and some invertebrates and fish. Elevated copper levels were found in the trout collected from upstream coldwater river reaches. Generally, copper concentrations in plants, invertebrates, and fish increased downstream from the coldwater areas. Selenium concentrations were clearly elevated in all biota above ambient background concentrations. Zinc concentrations in plants, invertebrates, and fish below Farmington to the “mixer area” (RM 135)¹¹ were generally higher than in the rest of the river, and it appears the source may be the Animas River. The study found no consistent correlation between contaminant concentrations and river discharges.

According to the Final Supplemental Environmental Impact Statement (FSEIS), ALP Project (Reclamation, 2000a), a number of water quality standards are periodically exceeded in the San Juan River in New Mexico and Utah. Above Farmington, New Mexico, there are a few historical exceedences in the San Juan River for aluminum, mercury, selenium, cadmium, and lead. The number of exceedences increases between Farmington and Shiprock, New Mexico, including several for copper and zinc. At Four Corners, New Mexico, the number of exceedences decreases and then increases again at Mexican Hat, Utah. According to Utah regulations, there are exceedences in nutrients and total dissolved solids (TDS).

The ALP Project FSEIS also reports that these historic values could be slightly affected by the operation of Navajo Dam for endangered fish and the increase in spring runoff flows will result in improvement of water quality during the runoff period, but the lower flows during the rest of the year will provide less dilution and may impact the water quality of the San Juan River.

Water Quality – Methodology

Impacts were evaluated by the following measures:

- Researching the existing water quality standards from New Mexico, Utah, and the Navajo Nation, and identifying differences among them for reservoir and river segments of the San Juan River

¹¹ The “mixer area” is a suspected Colorado pikeminnow spawning site.

- Researching available water quality reports and assessments to determine possible impacts to the San Juan River from changes in the operation of Navajo Reservoir
- Examining and comparing the hydrologic model output for each alternative to operations described in the Navajo Reservoir Operations FEIS 250/5000 Alternative to determine possible variations in flow from the future operation of Navajo Reservoir
- Evaluating the expected impacts on water quality against the Clean Water Act (CWA), Safe Drinking Water Act, Tribal, and State water quality standards

Water Quality Standards.—State and Tribal water quality standards have been developed and applied to the San Juan River from the States of New Mexico and Utah and the Navajo Nation. The States and Tribes have developed numeric and narrative standards for streams, rivers, and lakes within their boundaries. The Ute Mountain Ute Tribe is in the process of developing draft water quality standards and getting approval by the Environmental Protection Agency (EPA). The Navajo Nation adopted water quality standards for their reservation in 1999. The EPA approved the Navajo Nation Surface Water Quality Standards in March 2006, and the Navajo Nation’s program was authorized to issue Clean Water Act Section 401 certification for projects on Navajo lands. These standards are available at <<http://www.navajonationepa.org>>.

Regulators usually assess impacts to the surface water quality by looking at the exceedences of numeric standards. For the most part, fishery aquatic standards are divided into chronic and acute standards based on exposure time that the aquatic organisms experience. There are also narrative standards that have no numeric values, which regulate some physical attributes (i.e., color, odor, taste of fish, etc.). The chronic standard is often expressed as a 4-day average and the acute standard as a 1-hour average or single sample. Few water quality measurements are done this way. Most data are collected as a single sample and entered into a database as such. Exceedences for this PR/FEIS are based on comparing the single sample result to the chronic and acute standards as was done in the ALP Project FSEIS (Reclamation, 2000a). Violations of the water quality chronic standards are based on exceedences over a period of time (most standards have one violation in 3 years). Some States and Tribes/Tribal Nations allow an average of one violation every 3 years for a long period of record. Acute standards should never be exceeded.

State and Tribal.—States are required under the CWA to report to the EPA on the condition of the streams, rivers, and lakes within their boundaries. One of these reports is a list of impaired (does not meet its intended use) stream or river segments (referred to as a Section 303(d) list). This list generally indicates the water body segment, a probable

source of pollutant(s), uses not supported, and specific pollutant(s). The agency must develop a plan to improve the condition of the water body and meet its intended use. The present status of listing is:

- The Tribes are encouraged but not required to report impaired water bodies to the EPA.
- Based on the latest State of New Mexico Section 303(d) listing, the San Juan River designated uses are not supported on the following segments: (1) San Juan River from Canyon Largo to Navajo Dam (turbidity and stream bottom deposits), (2) from Animas River confluence to Canyon Largo (stream bottom sediments and fecal coliform), and (3) from the Navajo Nation boundary at the Hogback to Animas River confluence (stream bottom deposits).

Water Quality – Impacts Analysis

No Action Alternative.—Under the No Action Alternative, spring releases from Navajo Reservoir would be maintained at 5,000 cfs, but releases during the rest of the year could be lowered to 250 cfs. A 250-cfs release from Navajo Reservoir during the irrigation season would probably result in low flows (in the range of approximately 60–150 cfs) from Citizens Ditch (RM 217) diversion to Farmington (RM 181) due to irrigation demands. During the Summer Low Flow Test (Reclamation, 2002), several water quality parameters (temperature, aluminum, fecal coliform, total organic carbon, and conductivity) exceeded the State standards for this reach. Exceedences of water quality standards would probably continue at these lower flows over the long term.

Low releases after the spring runoff under the No Action Alternative would result in possible continued exceedences of water quality standards. If the exceedences occurred more than once in 3 years, a violation of the State or Tribal standards would occur. Short-duration low flow tests indicated some parameters exceeded the State’s standards from Navajo Dam to the Animas River confluence.

The New Mexico State Department of Environment is scheduled to complete total maximum daily load (TMDL) studies on several segments of the San Juan River within the next several years. The TMDLs will identify Best Management Practices (BMPs) that might be implemented to reduce nonpoint source pollutant loads into the San Juan River. BMPs taken to prevent violations of the State water quality standards would improve water quality in the river. Water quality parameter exceedences in the San Juan River from Farmington to Lake Powell would continue, but significant increases in exceedences would probably not occur due to maintenance of the 500 cfs minimum flows in the critical habitat sections.

Under the No Action Alternative, regular springtime snowmelt-runoff period peak releases of up to 5,000 cfs would result in cleaning of the San Juan River channel bottom of substantial amounts of suffocating sediment contributed by erosion of tributary drainages. Scouring of such sediment is periodically necessary to restore and maintain spawning gravel bars for endangered fish species and productive backwaters and side channels used by endangered fish for rearing habitat. Restoring such scouring is to restore the natural, pre-dam function to the river.

SJRPNM Alternative.—Construction of the PNM intake structure, water treatment facility, piping crossing the San Juan River, or other project facilities could temporarily increase the suspended sediment loads in the San Juan River. The implementation of mitigation measures to minimize construction-related impacts is described towards the end of this resource section.

During operation of the proposed project, a few exceedences might continue under the SJRPNM Alternative at the Four Corners and Bluff USGS gauges. Increases in exceedences at Shiprock might occur in fecal coliform, temperature, turbidity, and mercury. The exceedences in mercury probably occur because of the Navajo Nation coldwater habitat water use assigned to the San Juan River.¹² The coldwater habitat standards are lower than the other Navajo Nation water use standards, and other regulatory agencies have the San Juan River designated as a warmwater fishery.

Facilities with NPDES permits above the PNM diversion could benefit from increased flows in the river associated with the proposed project. The facility most affected by the change in flows would be the Bloomfield waste water treatment plant where the critical low flow of approximately 373 cfs is much higher than would occur under the No Action Alternative. During the Summer Low Flow Test, flows in the vicinity of the Bloomfield waste water treatment plant were 130 cfs, significantly lower than the critical low flow loading requirements for the permit. Other facilities with NPDES permits would not be affected on the San Juan River.

Under the SJRPNM Alternative, the critical elements of the Flow Recommendations would be met and regular springtime snowmelt-runoff period peak releases of up to 5,000 cfs would result in cleaning of the San Juan River channel bottom as described in the No Action Alternative.

NIIP Amarillo Alternative.—Potential construction-related impacts associated with the NIIP Amarillo Alternative would be less than the SJRPNM Alternative because all water is delivered through the existing NIIP facilities and there are no new facilities constructed

¹² Since the detection limit for mercury is higher than the standard, it is unknown if the standard is exceeded, and, for this analysis, it is assumed that the standard is exceeded because it is so low.

on the San Juan River. Implementation of the proposed mitigation measures described below would reduce construction-related impacts to an insignificant level. Operation of the NIIP Amarillo Alternative would result in no predicted change to water quality when compared to the No Action Alternative because all project water is delivered through the NIIP facilities with no additional releases downstream from Navajo Dam.

Under the NIIP Amarillo Alternative, the critical elements of the Flow Recommendations would also be met and regular springtime snowmelt-runoff period peak releases of up to 5,000 cfs would result in cleaning of the San Juan River channel bottom as described in the No Action Alternative.

Water Quality – Mitigation Measures

The significance of construction-related water quality impacts would be reduced to less than significant through the following measures:

- Reclamation or the contractor would be required to obtain CWA discharge permits from the appropriate regulatory agency. A CWA NPDES storm water permit would also be obtained.
- BMPs and construction schedule techniques could be implemented to minimize adverse water quality impacts.
- Measures could be implemented to time construction activities to coincide with periods of low flow, and measures to capture sediment could be employed.
- The duration of placement of fill materials could be minimized to shorten the period of time to reduce the duration of turbidity.
- Temporary cofferdams/berms could be used to contain fine materials and placement of fill material during periods of low flows in the San Juan River.
- Stockpiles of fill materials could be placed above the ordinary high water marks and protected by measures to prevent erosion of those materials into the waters of the United States.
- Silt screens or other appropriate methods could be used in the San Juan River and at intermittent stream crossings to confine suspended particulates and turbidity to small areas where settling or removal could occur.

- Reclamation would comply with applicable New Mexico and Navajo Nation water quality standards. Permits would be obtained as appropriate under CWA sections 401 (water quality certification), 402 (dewatering), and 404 (dredge and fill).

Water Quality – Summary of Impacts

Under the No Action and NIIP Amarillo Alternatives, existing trends of water quality degradation would be expected to continue in the San Juan River below Navajo Dam.

Under the SJRPNM Alternative, increased releases from Navajo Dam would lower concentrations of contaminants in the San Juan River because of dilution; however, these effects may be insignificant and difficult to measure. The NPDES Bloomfield waste water treatment plant above the PNM diversion could also benefit from increased flows in the river associated with the proposed project.

Vegetation Resources

This section discusses the potential impacts to vegetation resources that could result from actions associated with the No Action Alternative and the action alternatives considered.

Issue: How will the No Action Alternative and action alternatives affect upland and riparian vegetation resources?

Overview

Scope

The analysis includes vegetation resources associated with Navajo Reservoir, the San Juan River from Navajo Dam to Lake Powell, and all vegetation within 500 feet of the proposed pipeline alignments under the action alternatives. Actual pipeline disturbance may be 50 to 100 feet on either side of the pipeline. Because the level of detail included in final designs is not available, 500 feet was used as a conservative estimate to capture the various habitat types along the proposed pipeline alignments. Areas of vegetation to be removed for the placement of permanent project features are specifically noted. Protected plant species (Federal and Navajo listed species) are discussed in the “Special Status Species” section of this chapter.

Impact Indicators

Defined standards, determined by government regulatory agencies and accepted professional opinion, provide the necessary criteria to assess potential impact significance on vegetation resources for the proposed project (U.S. Army Corps of Engineers, 1987; Cowardin et al., 1979; Muldavin et al., 1996; Lowery et al., 2007). In accordance with these standards, potential outcomes in this analysis were considered significant if they resulted in the following:

- (1) Substantial reduction in the cover of native vegetation or native plant species
- (2) A change in the diversity of plant species or the introduction of new species

For specifically determining the effects of the proposed project on wetlands and riparian vegetation, outcomes were considered significant if they resulted in:

- (1) Conversion of wetland/riparian vegetation to upland vegetation
- (2) A net loss of wetland or riparian vegetation

Vegetation Resources – Affected Environment

Vegetation Classifications.—This section describes vegetation resource communities potentially affected by the proposed project. The project area consists of semiarid terrain with an average annual precipitation of 6 to 11 inches (U.S. Department of Commerce, 1965, 1976). Vegetation is sparse in areas, and soils are often rocky. Three separate vegetation surveys have been conducted along portions of the proposed pipeline routes (Gallup Environmental Assessment completed in 1981, the NIIP Plant Survey completed in May 1991, and an Ecosystem Research Institute [ESRI] field survey [2003a] completed in 2000 and 2002). Vegetation communities within the project area are shown in figure V-3. Eleven of the 20 vegetation classification types occur within the pipeline corridors and are described in greater detail in attachment K. This attachment contains a list of plant species found in the proposed project vicinity.

Riparian.—Riparian shrub communities were not included as a separate category with the geographic information system (GIS) analysis and are described here for the San Juan River downstream of Navajo Dam. Six types of riparian cover are recognized along the San Juan River, including Russian olive/tamarisk stands, willow thickets, riparian shrub habitat, riparian grass and forb habitat, and emergent wetlands (Reclamation, 2000). Since the impoundment of the San Juan River by Navajo Dam, flooding has decreased, and dense shrub thickets have become more common. Introduced Russian olive and

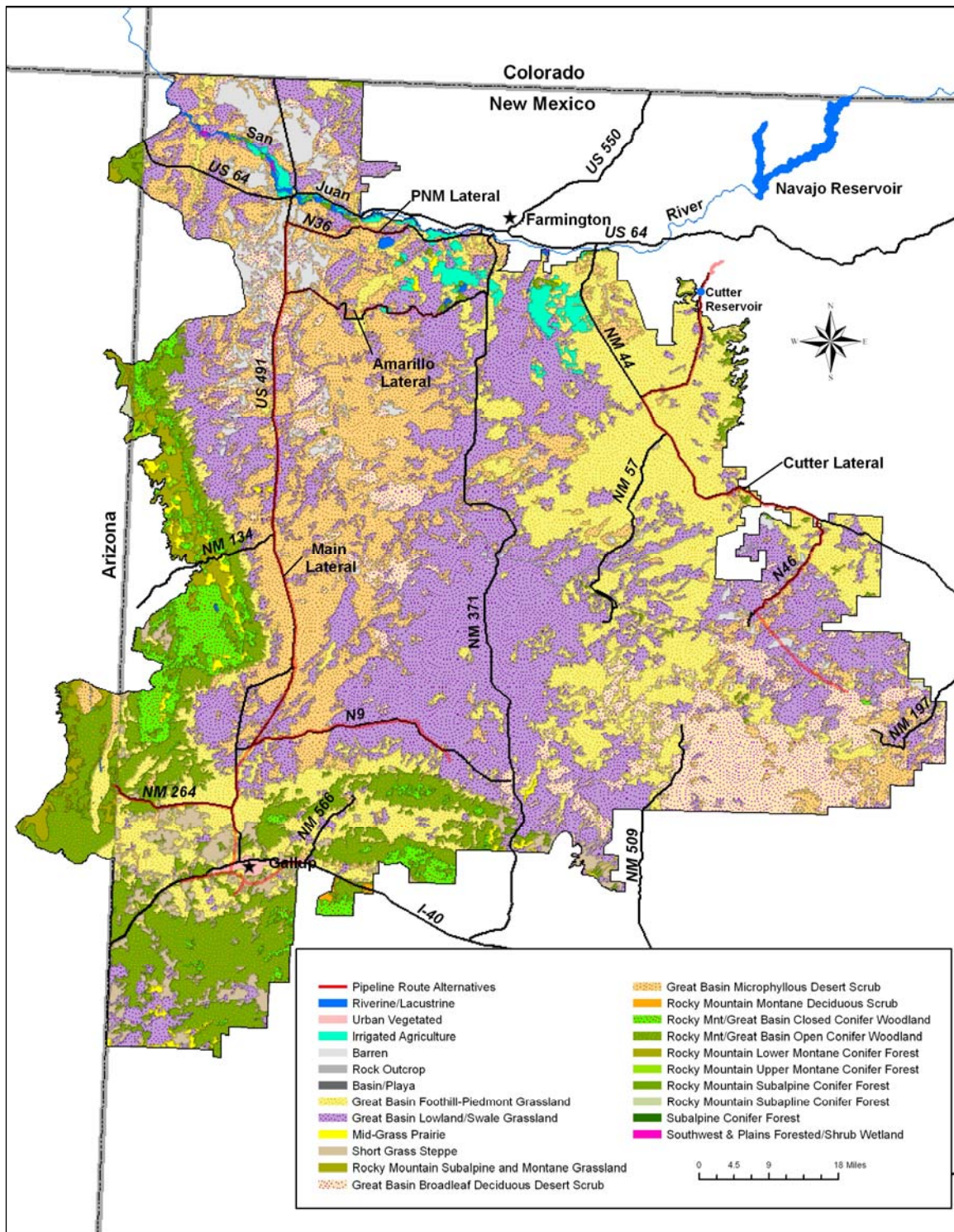


Figure V-3.—Gap analysis vegetation classification within the project service area.

tamarisk are dominant species within 98 feet of the San Juan River (37 and 30 percent of total vegetation, respectively) (Bliesner and Lamarra, 2000). Fremont cottonwood (*Populus fremontii*) occurs infrequently (7 percent) and reaches its highest density above RM 155. Native willows are common below RM 130. These riparian areas support a greater diversity of both vegetation and wildlife than the surrounding upland areas.

Wetlands.—The U.S. Army Corps of Engineers (*Federal Register*, 1982) and the EPA (*Federal Register*, 1980) jointly define wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands within the proposed project area are generally associated with the San Juan River, Cutter Reservoir, intermittent streams and arroyos, or irrigation.

Special Status Plants.—Plant species of concern include two federally endangered and two federally threatened species as well as seven Federal species of concern. The Navajo Nation considers 13 plants as endangered. Plant species of concern are discussed within the “Special Status Species” section of this chapter.

Vegetation Resources – Methodology

This section describes the methods used to measure the effects of the No Action, SJRPNM, and NIIP Amarillo Alternatives. The significance of such effects is evaluated based on the impact indicators outlined in the overview.

Twenty vegetation classifications were identified by the New Mexico Natural Heritage Program (NMNHP) and Arizona Natural Heritage Program within the proposed project area (attachment K). A GIS was used to quantify each of the habitat classification types within 500 feet of the SJRPNM and NIIP Amarillo pipeline routes. The gap analysis¹³ data have a 98-foot resolution, such that areas of habitat smaller than 98 feet may not be included in this analysis.

Specific vegetation classifications developed by the NMNHP (Muldavin et al., 1996) were used to classify vegetation within the 500 feet of the proposed pipeline routes. Gap analysis data were used to quantify plant communities in accordance with the NMNHP classifications. The 1,000-foot pipeline corridor represents the areas of vegetation

¹³ A comparison of the distribution of elements of biodiversity with that of areas managed for their long-term viability to identify elements with inadequate representation.

potentially disturbed during placement of the pipeline and accessory features. The estimate is conservative, and in most cases, a smaller area of vegetation will be affected.

Design drawings were used to enumerate the area of vegetation permanently removed for water development structures and to consider the extent and location of vegetation (volume II, appendix B). The same methods were used to evaluate project effects on wetland and riparian vegetation. Site visits were used to describe the general nature of riparian vegetation.

Wetland delineations were conducted to identify and describe wetlands that may be affected during construction of the action alternatives. Potentially affected wetlands were identified and mapped to provide pertinent information to determine jurisdictional and permitting requirements under section 404 of the CWA. Wetland delineations targeted the north side of the San Juan River immediately east of the PNM diversion dam and the outlet and base of Cutter Dam (ESRI, 2005).

Vegetation Resources – Impacts Analysis

This section describes the effects of the No Action, SJRPNM, and NIIP Alternatives on vegetation within the proposed project area. Mitigation measures are described and the net effects of each alternative, following mitigation, are evaluated. The significance of each effect is determined based on the impact indicators presented in the overview.

No Action Alternative.—Water conservation may alter urban landscaping and agricultural uses, and changes in irrigation water use could reduce wetlands associated with irrigation.

SJRPNM Alternative.—Under the SJRPNM Alternative, up to 31,686 acres of vegetation may be temporarily disturbed (table V-7) during construction of project facilities. The largest components of vegetation include 10,057 acres of Great Basin foothill-piedmont grassland, 8,290 acres of Great Basin lowland/swale grassland, and 7,477 acres of Great Basin microphyllous desert scrub. Impacts to vegetation would be less than 0.01 percent for each of the 12 vegetation classification types affected.

Up to 43 acres of vegetation would be removed for placement of a river pumping plant, 2 water treatment facilities, 17 forebay tanks and pumping plants, 4 regulating tanks, and 20 community storage tanks. Twenty-six acres of vegetation removed for placement of permanent project features would be native upland vegetation.

Seventeen acres of exotic riparian vegetation occur within 500 feet of the proposed alignment. Riparian vegetation in this area is composed primarily of Russian olive and tamarisk (ESRI, 2002). A limited amount of this vegetation may be disturbed during

Table V-7.—Acres of affected vegetation within the proposed project area

Vegetation classification type	Total project area	Affected by SJRPNM Alternative		Affected by NIIP Amarillo Alternative	
	Acres	Acres	Percent	Acres	Percent
Barren	156,356	761	0.0049	7,560	0.0048
Great Basin broadleaf deciduous desert scrub	466,412	1,270	0.0027	1,399	0.0030
Great Basin foothill-piedmont grassland	1,124,489	10,507	0.0093	10,586	0.0094
Great Basin lowland swale grassland	1,481,846	8,290	0.0056	8,518	0.0057
Great Basin microphyllous desert scrub	852,050	7,477	0.0088	8,518	0.0100
Irrigated agriculture	50,926	124	0.0024	109	0.0021
Riverine/lacustrine	10,037	42	0.0042	0	0
Rocky Mountain/Great Basin open conifer woodland	527,845	1,371	0.0026	1,371	0.0026
Rocky Mountain montane deciduous scrub	3,148	121	0.0384	121	0.0384
Short grass steppe	124,028	1,065	0.0086	1,065	0.0086
Urban vegetated	8,827	657	0.0744	657	0.0744
Total acres of vegetation classified within the proposed project area	4,668,243	31,686	0.0063	31,841	0.0063

construction. The SJRPNM Alternative would remove 18 acres of vegetation in the immediate vicinity of the San Juan River for pumping and water treatment facilities. A small area (0.09 acre) of non-native shrub cover would be removed to place the pump. The remaining acres are fallow agricultural land and would be removed for the water treatment facilities. However, releases made from Navajo Reservoir to meet project demands may help maintain existing riparian vegetation downstream of Navajo Dam to the PNM diversion structure.

Wetland delineations identified three separate wetlands within the San Juan River site: (1) 12.86 acres of palustrine shrub-scrub wetland, (2) 11.39 acres of persistent emergent palustrine wetland, and (3) 1.54 acres of persistent, palustrine emergent wetland. In addition, wetland delineations below Cutter Dam identified two persistent, palustrine emergent wetlands totaling 0.51 acre. Under the SJRPNM Alternative, 3.6 acres would be temporarily disturbed and 1.1 acres of palustrine wetlands would be permanently removed during the construction of project features. Wetlands permanently removed include 1.0 acre along the San Juan River and 0.1 acre below Cutter Dam.

Other waters of the United States that are protected under the CWA occur within and adjacent to the proposed project boundaries. These include the San Juan River and Cutter Reservoir adjacent to the wetland sites discussed above. Potential jurisdictional wetlands and/or other waters of the United States associated with crossing of intermittent streams

may occur along the proposed SJRPNM Alternative's pipeline route. The boundaries of these sites will be determined based on the presence of wetland vegetation, the ordinary high water mark as distinguished by a lack of terrestrial vegetation, and/or the accumulation of litter and debris on the shore.

Mitigation measures described below in the following "Vegetation Resources – Mitigation Measures" section could reduce impacts associated with pipeline construction and replace riparian and wetland habitats lost or impacted during the construction of project facilities.

NIIP Amarillo Alternative.—Under the NIIP Amarillo Alternative, up to 31,484 acres of vegetation may be disturbed. The largest component of vegetation includes 10,586 acres of Great Basin foothill-piedmont grassland, 8,518 acres of Great Basin lowland/swale grassland, and 7,260 acres of Great Basin microphyllous desert scrub (see table V-7). Impacts to vegetation would be less than 0.01 percent for each of the 12 vegetation classification types affected. In addition, a total of 249 acres of vegetation would be removed for placement of 2 water treatment facilities, 17 forebay tanks and pumping plants, 6 regulating tanks, 20 community storage tanks, and one 226-acre holding pond.

No riparian cover types were detected within one-half mile of the proposed NIIP Amarillo alignment; therefore, the NIIP Amarillo alignment is predicted to have no effect on existing riparian vegetation. There would be no benefit to riparian habitat downstream of Navajo Reservoir as described in the SJRPNM Alternative because all project demands would be delivered through the existing NIIP system with no additional releases downstream of Navajo Dam.

Wetland impacts would be limited to 0.1 acre permanently removed for project facilities below Cutter Dam. Other waters of the United States that are protected under the CWA occur within and adjacent to the proposed project boundaries, including Cutter Reservoir adjacent to the wetland sites discussed above. Potential jurisdictional wetlands and/or other waters of the United States associated with crossing of intermittent streams may occur along the proposed NIIP Amarillo Alternative's pipeline route. The boundaries of these sites will be determined based on the presence of wetland vegetation, the ordinary high water mark as distinguished by a lack of terrestrial vegetation, and/or the accumulation of litter and debris on the shore. Mitigation measures would be similar to those described under the SJRPNM Alternative.

Vegetation Resources – Mitigation Measures

General mitigation procedures could include:

Upland Sites

- Use accepted erosion control measures during construction
- Minimize pipeline and accessory components' footprints
- Seed disturbed areas with a mixture of local-source, native grasses
- Supplement grass seeding with native shrub seeds in areas where shrub cover is diminished due to pipeline disturbance
- Monitor plantings to ensure establishment of native cover equivalent to pre-construction disturbance levels
- Control noxious weeds in disturbed areas (i.e., herbicide applications)

Riparian and Wetland Sites

- Replant disturbed areas with native riparian/wetland shrubs, including coyote willow (*Salix exigua*) immediately following construction
- Clear tamarisk and Russian olive within 300 feet of project features and replant such areas with native riparian shrubs
- Monitor plantings to ensure establishment of native cover equivalent to pre-construction disturbance levels
- Replace removed riparian and wetland habitat with creation of acre-per-acre replacement or the enhancement of 3 acres for each acre lost. The CWA has statutory requirements that require mitigation for impacts to jurisdictional wetlands. In addition, Executive Order 11990 requires Federal agencies to “...take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency’s responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.”

Vegetation Resources – Summary of Impacts

Under the No Action Alternative, water conservation may alter urban landscaping and agricultural uses, and changes in irrigation water use could reduce wetlands associated with irrigation.

Construction of the SJRPNM Alternative would temporarily remove up to 31,686 acres of vegetation for pipeline construction assuming up to a 500-foot disturbance area on either side of the pipeline. Of the vegetation temporarily removed, 17 acres of exotic Russian olive and tamarisk would be replaced with native riparian vegetation within the San Juan River corridor. In addition, 3.6 acres of wetlands within the San Juan River corridor would be temporarily impacted during pipeline construction. Native grasses and shrubs comprise the largest vegetation resource affected.

Approximately 43 acres would be permanently removed for project features under the SJRPNM Alternative, including 0.09 acre of riparian shrub vegetation and 1.1 acres of wetland vegetation. Revegetation and restoration of upland areas and habitat enhancement in riparian zones would minimize project effects.

Construction of the NIIP Amarillo Alternative would disturb up to 31,841 acres of vegetation. In addition, 249 acres would be permanently removed for project features, including 1.1 acres of wetland vegetation. Riparian vegetation would not be impacted during construction activities.

Implementation of mitigation measures to revegetate and restore upland areas, enhance habitat in riparian zones, and provide compensatory wetland mitigation as proposed would minimize project effects.

Wildlife Resources

This section addresses the present status of, and project-related impacts to, wildlife resources in the proposed project area.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect wildlife resources?

Overview

Scope

The scope of this analysis includes terrestrial wildlife resources found within one-half mile of the SJRPNM and NIIP Amarillo proposed pipeline alignments

and all wildlife habitat found within 500 feet of these alignments. Fisheries and aquatic wildlife are discussed in the “Aquatic Resources” section of this chapter. Federal and Navajo Nation listed and candidate species are discussed in the “Special Status Species” section of this chapter.

Impact Indicators

Defined standards, determined by government regulatory agencies and accepted professional opinion, provide the necessary criteria to assess potential impact significance on aquatic resources for the proposed project. In accordance with these standards, potential outcomes in this analysis were considered significant if they resulted in the following:

- (1) Substantially diminished habitat for wildlife
- (2) A deterioration of existing wildlife habitat
- (3) A permanent loss of key wildlife habitat (e.g., wintering grounds, wetlands)
- (4) Disturbance to wildlife key critical stages (e.g., nesting, breeding)

Wildlife Resources – Affected Environment

This section describes wildlife habitat and common wildlife species that may be affected by the SJRPNM and NIIP Amarillo Alternatives. Descriptions include common wildlife and habitat within 500 feet of the proposed pipeline alignments. Federal and Navajo Nation threatened, endangered, candidate, and species of concern are discussed in the “Special Status Species” section of this chapter.

Wildlife Habitat.—Wildlife habitat can be broken into three main categories in the proposed project area: (1) bottomland riparian/wetland habitat, (2) irrigated agriculture and urban habitat, and (3) arid upland habitat. Wildlife investigations conducted in 1983 (Reclamation, 1983) within a portion of the proposed project area and gap analysis data show that habitat within the 1983 study area and the proposed project area are proportioned similarly. A list of wildlife species and habitat associations that may occur in the proposed project area is presented in attachment L.

Bottomland, riparian, and wetland habitat within the proposed project area include the San Juan River and Chaco Rivers and numerous arroyos. Both cover and forage are provided by this habitat for the following:

- Nine of the 11 amphibian species found in the area depend on this habitat.
- Fifteen of the 34 reptile species found in the proposed project area use bottomlands, and 3 use these habitat types exclusively (Reclamation, 1983).
- A broad variety of birds use riparian habitat as wintering, resting, and nesting areas (these bottomland areas are considered essential to maintaining avian diversity in the area).
- Large and small mammals and reptiles also rely on these types of habitat. Over one-half of the 84 mammals found in the proposed project area use riparian/wetland habitat (Reclamation, 1983).

Irrigated agriculture and urban habitat provide important wildlife habitat in the arid project landscape. These habitat types are located along the San Juan River corridor as well as in and around the NIIP near Farmington, New Mexico. The interspersed crops, fencerows, ditchbanks, orchards, and plentiful water create high-value wildlife habitat. The highest abundance of birds in the proposed project area is found within agricultural fencerow habitat. Large and small mammals, birds, amphibians, and reptiles use these habitat types.

Vegetation and associated wildlife are sparse within the upland habitat due to low precipitation and extensive grazing. According to a 1981 report by the Service, “In certain areas there is virtually no vegetation. Most of these lands are open to livestock grazing, primarily sheep. The heavy grazing pressure along with the lack of regular water supply greatly limits both the plant and wildlife diversity.” Of 105 avian species commonly found in the proposed project area, 43 were associated with upland grass habitat (Reclamation, 1983). Of the 50 mammal species using upland habitat, 4 were exclusively associated with arid shrub/grassland habitat. Amphibians and reptiles show the same trend, with 5 species linked to grassland/shrub communities out of the 45 species potentially present in the proposed project area.

Common Wildlife Species.—Eighty-four mammal, 11 amphibian, 34 reptile, and 150 avian species have been recorded within habitat types that occur within the proposed project area (attachment K; Reclamation, 1983). Recent information on wildlife in the proposed project vicinity is limited to censuses of elk and mule deer. Mid-winter 2002 aerial surveys of State lands in Game Management Unit 7 adjacent to the Navajo Nation estimate four elk per square mile and fewer than one mule deer per square mile in (the western and central portion) of the proposed project. Estimates in Game Management Unit 2B (northeastern portion of San Juan County, New Mexico) include approximately 5,100 deer and 1,350 elk (ESRI, 2003a).

San Juan and McKinley Counties in New Mexico exhibit relatively high trapping rates for fur-bearing mammals including coyote, gray fox, bobcat, red fox, kit fox, badger, raccoon, ringtail, spotted skunk, striped skunk, weasel, muskrat, and beaver. Trapping records show a declining trend for kit fox and muskrat and an increasing trend for bobcat (New Mexico Department of Game and Fish [NMDGF], 2000).

Common species observed during field surveys included Gunnison's prairie dog, kangaroo rat, deer mice, chipmunk, coyote, badger, bobcat, red-tailed hawk, ferruginous hawk, packrat, red fox, and golden eagle (ESRI, 2002). Ferruginous hawk and golden eagle are Navajo Nation listed species and discussed in greater detail in the "Special Status Species" section of this chapter.

Wildlife Resources – Methodology

This section describes the methods used to measure the effects of the SJRPNM and NIIP Amarillo Alternatives relative to the No Action Alternative. The significance of such effects is evaluated based on the impact indicators outline in the overview. Reports from the NMDGF, Navajo Department of Fish and Wildlife, the Service, Bureau of Land Management (BLM), and Reclamation were reviewed to compile a description of wildlife in the proposed project area. In addition, field surveys were conducted on approximately 290 miles of the proposed pipeline alignments. The route was walked in increments along the centerline and wildlife observations made to both sides. Binoculars and close visual inspections were used throughout the survey. Sandstone cliffs, large trees, and utility structures within one-quarter mile of the proposed routes were visually inspected for raptor nests, and perching and roosting sites. Both direct sightings and indirect evidence (tracks, droppings, burrows, and others) were used to document wildlife presence in the proposed project area (ESRI, 2003a).

Wildlife Resources – Impacts Analysis

This section describes the effects of the No Action, SJRPNM, and NIIP Amarillo Alternatives on wildlife within the proposed project area. Implementation of the SJRPNM or NIIP Amarillo Alternatives would alter or remove areas of wildlife habitat. In addition, construction activities might disturb animals using the proposed project area. Maintenance of project facilities might create long-term disturbance, and powerlines associated with pumping plants and project facilities might pose a hazard to raptors and other birds.

No Action Alternative.—The No Action Alternative would have no effect on wildlife habitat or wildlife resources within the proposed project area. The proposed project would not be constructed and no ground-disturbing activities would impact wildlife habitat or wildlife resources.

SJRPNM Alternative.—Temporary disturbance during construction may be the largest impact to wildlife under the SJRPNM Alternative. Because many desert species are nocturnal, direct interaction may not occur. However, small mammal and reptile burrows may be disturbed and their occupants dispersed during construction. Interference during the nesting season may cause nest failures for birds along the pipeline routes. Long-term disturbance to wildlife from maintenance activities would be minimal because the pipeline route mainly follows existing roads. Therefore, wildlife should be habituated to human presence in these areas.

The SJRPNM Alternative would temporarily disturb up to 31,686 acres of wildlife habitat. Key habitat within this alignment includes: (1) potential raptor nesting along the Defiance Monocline near Window Rock, Arizona; (2) raptor nesting along the Nutria Monocline northeast of Gallup, New Mexico; (3) raptor hunting areas southwest of Nageezi, New Mexico, and east of Sheep Springs, New Mexico; (4) riparian vegetation and wetlands along the San Juan River; and (5) raptor nesting areas in Blanco and Cutter Canyons.

Because project construction is proposed in phases (possibly a 10-year period or more) and the pipeline corridors are proposed to be revegetated concurrently with construction, wildlife habitat loss would be minimal. Key habitat that would temporarily be removed during pipeline construction consists of 17 acres of riparian habitat and 3.6 acres of wetlands. In addition, 3.26 acres of raptor cliff nesting habitat may be impacted. The riparian habitat, composed primarily of exotic Russian olive and tamarisk, could be revegetated with native riparian species. Following vegetation restoration, increased riparian wildlife habitat value is anticipated.

Other project features would permanently displace approximately 43 acres of habitat and result in the loss of 1.19 acres within key wildlife habitat. Construction of the water treatment facility and river pump along the San Juan River would result in the permanent loss of 1.9 acres of key habitat (0.09 acre of riparian shrub and 1.0 acre of wetland habitat). An additional 0.1 acres of wetlands would be permanently removed for construction of the Cutter water treatment plant.

Power transmission lines and substations pose an additional threat to birds in the proposed project area. Hazards associated with powerlines include the risk of electrocution to perching raptors and a risk of avian collision. The SJRPNM Alternative includes approximately 107 miles of transmission line. The barren nature of the proposed project area creates a relatively high electrocution risk to raptors, as they may select utility structures from which to perch and hunt. Electrocution occurs when two or more conductors are contacted simultaneously. Thus, large-winged raptors are at greater risk than smaller birds (Bevanger, 1994).

Project effects on small mammals and reptiles would be temporary, but should not be significant because the effects would be temporary, and suitable habitat is available outside disturbed areas. Large, mobile animals may avoid areas during construction, but these impacts would be temporary.

San Juan River habitat is used for both nesting and migration for many bird species. Restricting San Juan River pipeline crossing construction activities to low flow periods would provide adequate protection to nesting birds along the San Juan River. Adjacent areas for project facilities (siltation ponds and pumping plants) would occur in disturbed areas with non-native vegetation. In addition, these features would be adjacent to the PNM diversion dam and near the highway where existing wildlife have become habituated to these disturbances. Construction and maintenance activities along river habitat may disturb wildlife during critical periods; however, this is not considered a significant impact. Implementation of proposed mitigation measures would minimize or avoid impacts to wildlife.

NIIP Amarillo Alternative.—The NIIP Amarillo Alternative would temporarily disturb up to 31,841 acres of wildlife habitat. Project structures would permanently displace up to 249 acres of upland habitat. In addition, 0.1 acre of wetlands considered to be a key wildlife habitat would be removed.

Under the NIIP Amarillo Alternative, no riparian habitats would be affected. Other disturbances to wildlife would be similar to those caused by the SJRPNM Alternative; however, additional upland habitat would be inundated for the storage reservoir. Implementation of proposed mitigation measures would minimize or avoid impacts to wildlife.

Wildlife Resources – Mitigation Measures

The following proposed mitigation measures would minimize project effects on wildlife. Habitat disturbance caused by the placement of pipeline would be temporary because of the restoration planned for disturbed vegetation.

- To minimize disturbance of raptors, activities along the Nutria and Defiance Monoclines, Cutter Canyon, Blanco Canyon, and the corridor from Cutter to Largo Canyons could be restricted during the nesting season (January 15 to July 15). If that is not possible, extensive nest searches could be made up to three-quarters of a mile of proposed activities immediately prior to construction and active nests avoided. Raptor perch guards or raptor-safe configurations could be incorporated for all transmission structures.

- Transmission lines that pose a high collision risk could be marked with spiral vibration dampers or bird flight diverters.
- To comply with the Migratory Bird Treaty Act, removal of riparian and wetland vegetation that has the potential to impact nesting birds or active nests would be restricted from March 15 to August 15.
- Construction of the pipeline river crossing could be restricted to low water periods to minimize construction dewatering costs and to reduce potential risks of flooding. This restriction would prevent construction within the San Juan River during the normal nesting season for most migratory bird species that occur along the San Juan River.
- Trenching and burying pipeline concurrently could be implemented to minimize trapping of small wildlife. Escape ramps could also be built for trenches left open overnight.
- The mitigation measures proposed in the “Vegetation Resources” section of this chapter could also minimize impacts to wildlife.

Wildlife Resources – Summary of Impacts

Temporary disturbance during construction would be the largest impact to wildlife under the action alternatives. The alternatives could temporarily disturb large areas of wildlife habitat (31,686 acres—SJRPNM and 31,841 acres—NIIP Amarillo) during pipeline construction. Construction of project facilities would result in the permanent loss of wildlife habitat (43 acres—SJRPNM and 249 acres—NIIP Amarillo). Temporary impacts to key habitat would occur under both alternatives (23.86 acres—SJRPNM and 3.26 acres—NIIP Amarillo). Permanent loss of key habitats would occur under both alternatives (1.19 acres—SJRPNM and 0.1 acre—NIIP Amarillo).

Both action alternatives would construct 19.2 miles of pipeline through raptor cliff nesting habitat and could temporarily affect 3.26 acres within raptor cliff nesting habitat. The 19.2 acres of transmission line also may pose an avian collision risk. Implementation of proposed mitigation measures could minimize or avoid impacts to wildlife and wildlife habitat.

Aquatic Resources

This section addresses the present status of and project-related impacts to aquatic resources in the proposed project area, including fish inhabiting both Navajo Reservoir and those downstream of the dam in the San Juan River to Lake Powell.

Issue: How do changes in reservoir levels affect the reservoir fishery, and how do changes in flow regimes affect the downstream aquatic ecosystem?

Overview

Scope

Non-native (game and nongame fish) and native fish and other aquatic wildlife in both Navajo Reservoir and in the San Juan River from Navajo Dam to Lake Powell. Threatened and endangered species are discussed in the “Special Status Species” section of this chapter.

Impact Indicators

Potential outcomes in this analysis were considered significant if they resulted in:

- (1) Adverse effects on hydrology in the San Juan River
 - (2) An undesirable change in the composition of the native fish community.
 - (3) Deterioration of trout habitat from Navajo Dam to Blanco, New Mexico
 - (4) An undesirable change in the composition of the Navajo Reservoir fish community.
-

Aquatic Resources – Affected Environment

This section describes fish, amphibians, and macroinvertebrates associated with Navajo Reservoir and the San Juan River downstream of Navajo Dam. Characteristics of the river environment are included. Table V-8 shows the fisheries resources that occur in Navajo Reservoir and the San Juan River from Navajo Dam downstream to Lake Powell.

Navajo Reservoir.—Navajo Reservoir began filling in 1963 with the completion of Navajo Dam. The reservoir extends 35 miles up the San Juan River, 13 miles up the Pine River, and 4 miles up the Piedra River. It has a maximum surface area of 15,610 acres and a storage capacity of 1,709,000 acre-feet (Reclamation, 2006). Releases from the reservoir maintain target flow levels for endangered fish in the San Juan River and support a tailwater trout fishery. In addition, the reservoir provides recreation opportunities, including angling for northern pike, catfish, smallmouth bass, rainbow trout, and kokanee salmon (Reclamation, 2006).

Table V-8.—Fishes documented in the Basin

Common name	Scientific name	Documented occurrence	
		Navajo Reservoir	San Juan River
Native			
Bluehead sucker	<i>Catostomus discobolus</i>	Yes	Yes
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	No	Yes
Flannelmouth sucker	<i>Catostomus latipinnis</i>	Yes	Yes
Razorback sucker	<i>Xyrauchen texanus</i>	No	Yes
Roundtail chub	<i>Gila robusta</i>	Yes	Yes
Mottled sculpin	<i>Cottus bairdi</i>	No	Yes
Speckled dace	<i>Rhinichthys osculus</i>	No	Yes
Non-native			
Black bullhead	<i>Ictalurus melas</i>	Yes	Yes
Black crappie	<i>Pomoxis nigromaculatus</i>	Yes	No
Bluegill	<i>Lepomis macrochirus</i>	Yes	Yes
Brown trout	<i>Salmo trutta</i>	Yes	Yes
Channel catfish	<i>Ictalurus punctatus</i>	Yes	Yes
Common carp	<i>Cyprinus carpio</i>	Yes	Yes
Fathead minnow	<i>Pimephales promelas</i>	No	Yes
Grass carp	<i>Ctenopharyngodon idella</i>	No	Yes
Green sunfish	<i>Lepomis cyanellus</i>	Yes	Yes
Kokanee salmon	<i>Onchorhynchus nerka</i>	Yes	No
Largemouth bass	<i>Micropterus salmoides</i>	Yes	Yes
Western mosquitofish	<i>Gambusia affinis</i>	No	Yes
Northern pike	<i>Esox lucius</i>	Yes	No
Plains killifish	<i>Fundulus zebrinus</i>	No	Yes
Rainbow trout	<i>Onchorhynchus mykiss</i>	Yes	Yes
Red shiner	<i>Cyprinella lutrensis</i>	No	Yes
Smallmouth bass	<i>Micropterus dolomieu</i>	Yes	Yes
Striped bass ¹	<i>Morone saxatilis</i>	No	Yes
Threadfin shad	<i>Dorosoma petenense</i>		Yes
Walleye ¹	<i>Stizostedion vitreum</i>	No	Yes
White sucker	<i>Catostomus commersoni</i>	Yes	Yes
Yellow perch	<i>Perca flavescens</i>	Yes	No
Hybrid			
Bluehead x flannelmouth	<i>Catostomus discobolus x latipinnis</i>	No	Yes
White sucker x bluehead	<i>Catostomus commersoni x discobolus</i>	No	Yes
White sucker x flannelmouth	<i>Catostomus commersoni x latipinnis</i>	No	Yes

¹ Found in the lower reach of the San Juan River near Lake Powell.

San Juan River.—The San Juan River originates in the San Juan Mountains of southwestern Colorado. Its course extends south into New Mexico and then turns west to its confluence with Lake Powell in Utah. Along its 354-mile length, the San Juan River drains 38,300 square miles in Colorado, Arizona, New Mexico, and Utah. Since the closure of Glen Canyon Dam, the lower 54 miles of the San Juan River have been inundated by Lake Powell. Currently, there are 223 miles of river between Navajo Dam and Lake Powell.

Prior to the completion of Navajo Dam, the San Juan River showed an extremely variable hydrograph characterized by peak spring flows associated with snowmelt and by low summer and winter base flows; late summer and fall storms caused dramatic spikes in flow. Over the period of record (1929–61), unregulated median daily peak flows averaged 10,500 cfs at Bluff, Utah (range 3,810–33,800 cfs) during spring runoff, and 73 percent of yearly flows occurred between March 1 and July 31 (Bliesner and Lamarra, 2000). Although spring flows accounted for the majority of discharge, storms often created spikes in the hydrograph larger than those recorded during spring runoff. Such short-duration peaks moved sediment and restructured habitat. In contrast to a maximum daily flow of 42,500 cfs, base flows often approached zero prior to regulation by Navajo Dam. Regulated flows dropped below 50 cfs during 29 percent of the years studied (Bliesner and Lamarra, 2000). Flash flooding from tributaries and erodible soils along the river created high sediment loads. Thus, native vertebrate and invertebrate species within the San Juan River are adapted to high-velocity, turbid conditions.

After Navajo Dam was completed, peak flows were created by late winter releases designed to increase available reservoir storage prior to snowmelt. The magnitude of such peaks was reduced relative to pre-dam conditions, whereas base flows increased.

Median monthly base flows for August through February averaged 168 percent of original base flows. Near-zero-flow conditions were eliminated, and minimum average monthly flows increased from 65 cfs to 250 cfs (Bliesner and Lamarra, 2000). Since 1991, Navajo Dam has been operated to more closely mimic the San Juan River's natural hydrograph (Holden, 1999). This reoperation is designed to improve habitat and conditions for federally protected fish. Peak flows are timed to coincide with those from the Animas River during spring runoff. The magnitude of flows is based on snowpack. Various flow parameters are set to mimic natural variability in the system (Holden, 1999) as described in the Flow Recommendations.

The San Juan River between Navajo Dam and Lake Powell has been partitioned into eight reaches based on geomorphology and other channel characteristics. A brief description of each reach, taken from Bliesner and Lamarra (2000), is shown in figure V-4 and presented below.

- *Reach 1* (RM 0 to 16) is a low-gradient, sand-bottomed reach created by backwater from Lake Powell.

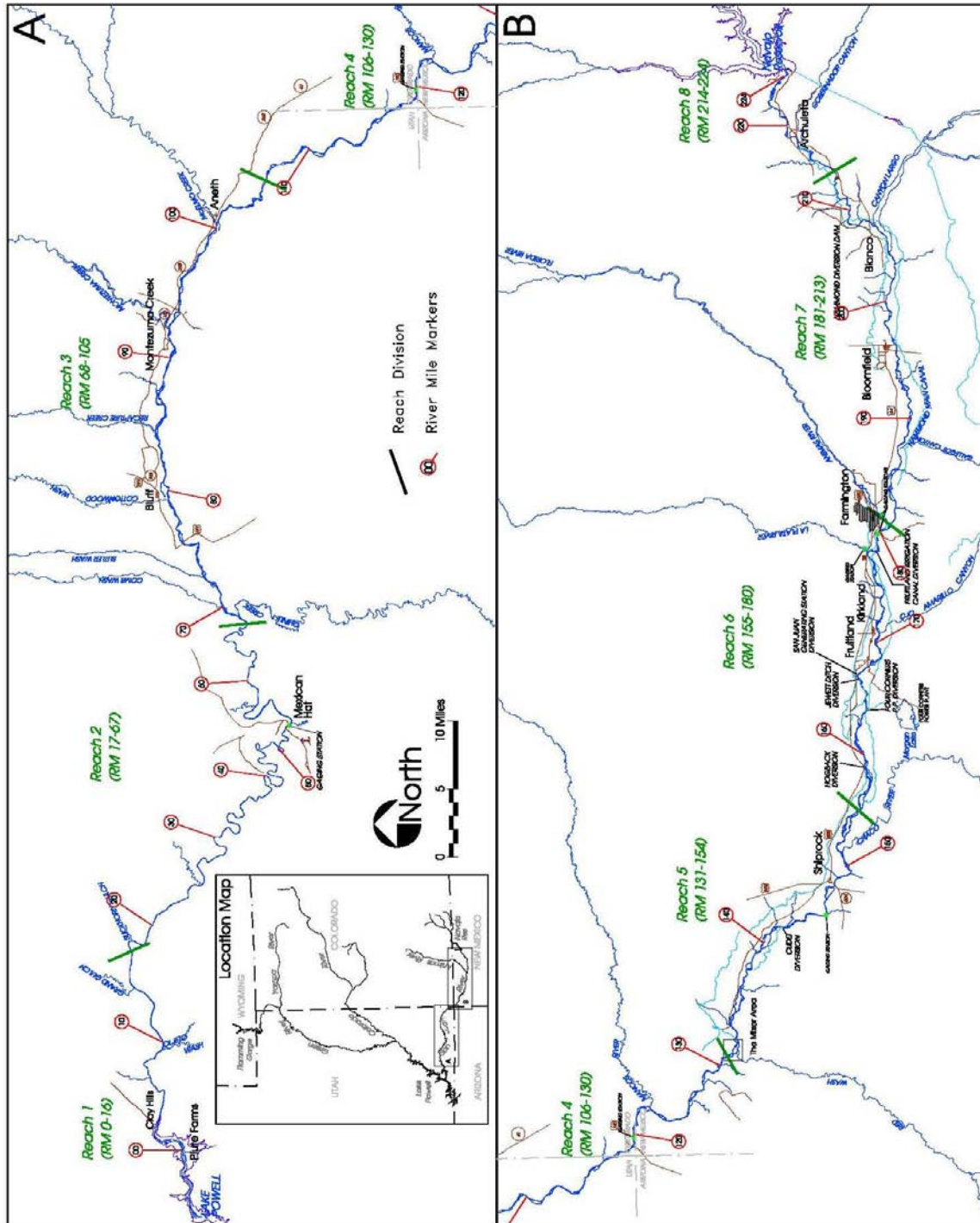


Figure V-4.—San Juan RM locations.

- *Reach 2* (RM 17 to 67) is canyon-bound but is located above the influence of Lake Powell, with higher gradient, dominated by riffle-type habitat.
- *Reach 3* (RM 68 to 105) is characterized by higher sinuosity and lower gradient (second lowest) than the other reaches, a broad flood plain, multiple channels, high island count, and high percentage of sand substrate. Backwaters are more abundant, but are easily perturbed by summer stormflows.
- *Reach 4* (RM 106 to 130) is a transition reach between the upper cobble-dominated reaches and the lower sand-dominated reaches with relatively low abundance of backwaters and little clean cobble.
- *Reach 5* (RM 131 to 154) is predominately multichanneled. Backwaters and spawning bars in this reach are much less subject to perturbation during summer and fall storm events than the lower reaches.
- *Reach 6* (RM 155 to 180) is predominately a single channel. Cobble and gravel substrates dominate, and cobble bars with clean interstitial space are more abundant in this reach than in any other. Four diversion dams limit upstream movement of fish.
- *Reach 7* (RM 181 to 213) is similar to Reach 6 in terms of channel morphology. The river channel is very stable, consisting primarily of embedded cobble substrate as a result of controlled releases from Navajo Dam, and much of the river bank has been stabilized and/or diked.
- *Reach 8* (RM 214 to 224) is the most directly influenced by Navajo Dam, which is situated at its uppermost end (RM 224). This reach is predominately a single channel with cobble substrate and clean, cold water as a result of Navajo Dam.

Along with streamflow, channel morphology and geology are the primary factors influencing aquatic habitat. Unless otherwise noted, the following information on channel morphology, geology, and riparian habitat is taken from analyses conducted by Bliesner and Lamarra (2000).

The San Juan River valley ranges from less than 655 feet to more than 2 miles across. After an initial canyon-bound reach below Navajo Dam, the river valley widens beyond RM 208 to over 1.86 miles across near Shiprock, New Mexico. From there, the river valley narrows to a width of about 3,280 feet until it becomes canyon-bound below RM 68. The San Juan River reaches its maximum gradient near RM 18. The slope generally decreases to RM 140 and then steepens from RM 68 as it enters the canyon. Channel sinuosity is lowest in the canyon reaches and highest in the reach immediately below Navajo Dam. Sinuosity values range from 1.000 to 1.195. The river channel appears most stable between RM 119 and RM 135 based on the area of cutbanks along

both sides. Sand is the primary source material found in cutbanks along the river (64 percent), with cobble and gravel also common (22 and 14 percent, respectively). Riparian vegetation within 98 feet of the channel is dominated by non-native Russian olive (37 percent) and tamarisk (30 percent). Cottonwood (7 percent) and willow (6 percent) are also present.

From Navajo Dam to Lake Powell, runs are the most common aquatic habitat at low, medium, and high flows (80 to 84 percent total wetted area). Riffles and shoals are the second most common habitat (3 to 9 percent total wetted area depending on flows) except during high flows when inundated vegetation becomes a common habitat (5.6 percent total wetted area) (Bliesner and Lamarra, 2000). Low-velocity habitat makes up a small portion of the total wetted area (approximately 3.5 percent), and backwaters comprise less than 1 percent of the wetted area.

Aquatic Invertebrate Community.—The aquatic invertebrate community is comparatively simple with the majority of the biomass composed of caddisflies, bloodworms, midges, and gnats (*Hydropsyche* species and *Chironomidae*). These species are indicative of sediment-laden river systems. The San Juan River reaches its highest productivity in upstream Reaches 6, 7, and 8 (Bliesner and Lamarra, 2000). The lowest densities of aquatic macroinvertebrates are found in Reach 2.

Fish.—The San Juan River fish community is characterized as highly endemic with species adapted to harsh, turbid conditions. Twenty-six fish species are found in the San Juan River, including 7 native, 22 non-native, and 3 hybrid (Ryden, 2000a). However, six of these species—three native and three introduced—comprise 99 percent of the fish found in the river. The most abundant native fish include the flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*), and speckled dace (*Rhinichthys osculus*). Abundant non-native fish include the channel catfish (*Ictalurus punctatus*), common carp (*Cyprinus carpio*), and red shiner (*Richardsonius balteatus*). Roundtail chub (*Gila robusta*) collected in the San Juan River appear to be from resident populations in the Animas, La Plata, and Mancos Rivers and do not seem to be established within the main stem of the San Juan River.

In general, the density of native fish species increases upstream to near Farmington, New Mexico (RM 180). This longitudinal increase in density is driven primarily by flannelmouth and bluehead suckers, which exhibit high abundances in Reaches 5 and 6 (Ryden, 2000a). Above RM 180, hypolimnetic releases from Navajo Dam cool the San Juan River and favor an introduced trout fishery. Beginning in 1995, walleye, striped bass, and threadfin shad (non-native fish species) were accidentally introduced to the San Juan River fish community when a waterfall restricting movement of Lake Powell fishes into the San Juan River at RM 0.0 was inundated (Ryden, 2000a).

Threadfin shad remained in the lower reaches of the river, whereas the predacious striped bass and walleye have been collected upstream to RM 91 and 108, respectively (Ryden, 2000a).

Native Fishes.— Seven native fish species and one hybrid occur in the San Juan River and make up 74.6 percent of the community as measured by main channel electrofishing (Ryden, 2000a and 2000b). The most abundant native fish is the flannelmouth sucker, followed by the bluehead sucker (58.1 and 12.7 percent, respectively). Two native species are described briefly here. Five rare or endangered native species—Colorado pikeminnow, razorback sucker, roundtail chub, bluehead sucker, and mottled sculpin—are described in more detail in the “Special Status Species” section of this chapter. Emphasis is placed on species distribution and habitat within Reach 6 because this is the area where the withdrawal facilities for the SJRPNM Alternative would be located.

Flannelmouth Sucker – The flannelmouth sucker is endemic to the Colorado River system. Flannelmouth sucker prefer pools and low-gradient reaches and are absent from impoundments. These suckers are benthic feeders and consume detritus, algae, periphyton, plants, and insects. They spawn over gravel areas during late spring and early summer.

In the San Juan River, the flannelmouth sucker is found in very limited numbers above RM 205 near Blanco, New Mexico, and occur more abundantly downstream of RM 180 near Farmington, New Mexico (Wethington, 2002; Ryden, 2000a). Spawning flannelmouth sucker appear to use cobbles within Reaches 5 and 6 (see figure V-4), although other areas are likely also used (Holden, 1999). Reach 6 has higher numbers of large juvenile and adult fish than the river downstream and is an important spawning area for the flannelmouth sucker (Holden, 1999). The number of large flannelmouth sucker present here may also provide an important prey base for Colorado pikeminnow.

Speckled Dace – The speckled dace is found in many drainages west of the Continental Divide. The species reaches its highest abundance in small- to medium-sized rivers and prefers shallow, slow-moving waters. Speckled dace are bottom feeders and consume aquatic insects, plant material, and zooplankton. They broadcast spawn over gravel areas. Speckled dace spawn principally during the spring, but may also spawn during late summer in the San Juan River (Platania et al., 2000).

Seine sampling in the San Juan River in low velocity habitat, targeted at small-bodied fish, found speckled dace to be the most common native fish (Propst et al., 2003). Speckled dace are found in very limited numbers upstream of RM 205 near Blanco, New Mexico, where introduced trout are the dominant species (Wethington, 2002). The highest concentrations of speckled dace in the San Juan River occur in Reaches 4, 5, and 6 (figure V-4) and are rare below RM 68 (Ryden, 2000a; Propst et al., 2003). No speckled dace have been caught below RM 13 (Ryden, 2000a).

Non-Native Fishes.—Twenty-one non-native fish species and two hybrid occur in the San Juan River. During main channel electrofishing from Lake Powell to Farmington, New Mexico (RM 3 to RM 180), non-native fish accounted for 25.4 percent of the catch (Ryden, 2000a and 2000b). Thirteen of these non-native species are either known or potential predators of native fish. Dietary overlap among species suggests that non-natives may also place competitive pressure on native San Juan River fish. Furthermore, 12 non-native species are spiny-rayed and may pose a documented choking hazard to Colorado pikeminnow. However, only channel catfish have been documented in Colorado pikeminnow (Ryden, 2000b). Channel catfish, common carp, and red shiner are the most abundant non-native fish.

Tailwater Trout Fishery.—Navajo Dam tailwater provides high quality trout habitat with its characterized cobble substrate and the dam's cool deep water releases. The NMDGF manages the tailwater as a trout fishery from the base of Navajo Dam 17 miles downstream to Blanco, New Mexico.

The value of the San Juan trout fishery to the NMDGF is significant, and the long-term management is an important component of the economic and recreational resources of the State of New Mexico (NMDGF, 2008).

Annual NMDGF electrofishing surveys from 1997–2001 found an increasing percentage of brown trout in the special trout water and regular regulation reaches. Increases in brown trout numbers may be due to improved spawning success associated with high spring releases from Navajo Dam. The average length of rainbow trout from the special regulation waters was 15 inches, and on average, 18 percent of the rainbow trout were over 18 inches. In contrast, less than 2 percent of trout in the regular regulation waters were over 18 inches; trout in regular regulation waters averaged 9 inches. Since then, NMDGF has managed the effects of whirling disease by stocking only fish 4 inches or larger (Wethington, 2002).

The fishery in the lower 10-mile reach is maintained primarily through natural reproduction of brown trout. In 1992, the fish composition within this reach included 62 percent native species (flannelmouth sucker, bluehead sucker, and mottled sculpin). By 1998, this number had declined to less than 1 percent. Higher releases from Navajo Dam associated with the 1991–97 Navajo Dam test flows may be causing this shift (Wethington, 2002).

Aquatic Wildlife.—The San Juan River and its associated riparian and marsh habitat support the greatest diversity of wildlife in the proposed project area. Five aquatic mammals known from the proposed project area occur only in the San Juan River and its flood plain—river otter (*Lutra Canadensis*), beaver (*Castor canadensis*), meadow vole (*Microtus pennsylvanicus*), muskrat (*Ondatra zibethica*), and mink (*Mustella vison*).

Waterfowl are common along the river, and populations have increased since the closure of Navajo Dam and development of the Square-B Ranch near Farmington as a waterfowl and wildlife preserve. Twenty-nine waterfowl species are found in the proposed project area, and 26.5 percent of avian species found in the proposed project area are restricted to breeding in riparian habitat (Reclamation, 1983).

Several amphibian species are tied to the San Juan River and tributaries in the proposed project area—tiger salamander (*Ambystoma tigrinum*), western spadefoot (*Scaphiopus hammondi*), plains spadefoot (*Scaphiopus bombifrons*), red-spotted toad (*Bufo punctatus*), Woodhouse’s toad (*Bufo woodhousei*), great plains toad (*Bufo cognatus*), chorus frog (*Pseudacris triseriata*), bullfrog (*Rana catesbeiana*), and northern leopard frog (*Rana pipiens*). Of these, the native northern leopard frog and the introduced bullfrog are found only in habitat within the San Juan River flood plain. The northern leopard frog is discussed in greater detail in the “Special Status Species” section of this chapter.

In addition, the smooth green snake (*Opheodrys vernalis*), common garter snake (*Thamnophis sirtalis*), and black-necked garter snake (*Thamnophis cryopsis*) are found only along the river (Reclamation, 1983).

Aquatic Resources – Methodology

This section describes the methods used to measure the effects of the No Action, SJRPNM, and NIIP Amarillo Alternatives on aquatic resources. The methods are presented here relative to five significance criteria used to assess effects.

(1) Effects on hydrology in the San Juan River

Modeling was used to evaluate effects of alternatives on hydrology in the San Juan River. Keller-Bliesner Engineering, LLC, modeled the No Action, SJRPNM, and NIIP Amarillo Alternatives using RiverWare¹⁴ (Bliesner, 2003). The San Juan River Basin Hydrologic Model¹⁵ was used as a starting point to configure the proposed project alternatives. Alternatives were modeled from water year 1929 to 1993. All alternatives considered include depletions for the ALP Project. The results of modeling were compared against Flow Recommendation criteria and are discussed in greater detail in the “Special Status Species” section of this chapter.

¹⁴ RiverWare is the software that runs the hydrologic model.

¹⁵ The San Juan River Basin Hydrologic Model was developed for the SJRBRIP for use in assessing impacts that water development would have on the endangered fish (Flow Recommendations).

(2) ***An undesirable change in the composition of the native fish community***

Effects on the native fish community were approximated based on the effects that each alternative would have on individual species. Bluehead sucker, flannelmouth sucker, and speckled dace were identified as native species vulnerable to entrainment (Platania et al., 2000; Ryden, 2000a). Estimates of entrainment were based on each species' distribution and the fraction of the flows diverted at the time of peak drift.

This analysis assumes that the portion of drifting larvae exiting a reach is directly related to the proportion of a species' population occupying that reach. This assumption provides a conservative estimate of the fraction of drift originating upstream of the proposed diversion for two reasons. First, a greater proportion of adult and large-sized native suckers are found within Reach 6 (RM 158.6–180) than are found within the downstream reaches (Ryden, 2000a). Adult fish comprise the spawning portion of the population and larger fish show greater fecundity. Thus, fish found in the reach above the proposed intake likely produce more larvae than an equivalent number of fish downstream. Second, abundant clean cobble substrates within Reach 6 provide more suitable spawning habitat than do embedded substrates found within downstream reaches (Bliesner and Lamarra, 2000). Thus, a greater proportion of spawning likely occurs above the proposed diversion.

This analysis also assumes that drifting larvae are evenly distributed in the water column. The size parameters used to determine drift for this analysis are from Platania et al. (2000) and refer to individuals with minimal or no control over their longitudinal movement. Such larvae are not sufficiently developed to actively move out of the current and into a low-velocity habitat. Thus, the drifting larvae are likely to be distributed randomly within the water column.

(3) ***Deterioration of trout habitat from Navajo Dam to Blanco, New Mexico***

Effects on the tailrace trout fishery were determined based on hydrology modeling and Reclamation design drawings.

Aquatic Resources – Impacts Analysis

This section describes the effects of the No Action, SJRPNM, and NIIP Amarillo Alternatives on aquatic resources. Mitigation plans are described, and each alternative's net effects are evaluated based on significance criteria.

No Action Alternative.—The No Action Alternative assumes that Navajo Reservoir is operated to meet the Flow Recommendations, as previously described. There is flexibility in summer releases from Navajo Dam that may delay changes in the San Juan River during an interim period; however, future conditions discussed below are expected to occur in the long term. The model configuration used for the No Action Alternative is identical to the Navajo Reservoir Operations FEIS model used by the SJRBRIP and includes no project water use.

SJRPNM Alternative.—The SJRPNM Alternative was modeled by taking the diversion/depletion of 33,118/31,247 acre-feet at the PNM diversion (table V-9). Return flow of 1,871 acre-feet is returned to the San Juan River downstream of Shiprock, New Mexico. An additional project depletion of 4,645 acre-feet is taken at the NIIP diversion above Navajo Dam. NIIP depletion is reduced to 250,000 acre-feet with groundwater accumulation of 7,000 acre-feet. All critical elements of the Flow Recommendations are met. All but two flow criteria are met under worst-case scenario, and these criteria have been determined by the SJRBRIP to be ineffective in accomplishing the anticipated effect (Miller, 2005). The 2,500 cfs criteria are missed by about 12 percent for 3 days in 1 year of the 65-year analysis period. Over the full model period, the Flow Recommendations are met 99.99 percent of the time.

Table V-9.—Summary of flow statistics for the SJRPNM Alternative

Parameter	Pre-dam (1929–61)	Post-dam (1962–93)	No Action Alternative ¹	SJRPNM Alternative ²	Flow target parameters
Average peak daily runoff (cfs)	12,409	6,749	8,791	8,793	
Average March–July runoff (acre-feet)	1,263,89	891,712	833,416	830,316	
>10,000 cfs for 5 days – frequency	39%	13%	27.7%	27.7%	20%
>8,000 cfs for 10 days – frequency	45%	17%	38.5%	38.5%	33%
>5,000 cfs for 21 days – frequency	64%	37%	50.8%	55.4%	50%
>2,500 cfs for 10 days – frequency	100%	83%	80%	78.5%	80%
Maximum years between flow events for minimum duration					
10,000 cfs – 5 days	4	14	10	10	10
8,000 cfs – 10 days	4	7	6	6	6
5,000 cfs – 21 days	4	7	4	4	4
2,500 cfs – 10 days	0	1	2	2	2
Average date of peak	May 31	June 1	June 1	June 4	
Average days for modeling period greater than indicated flow rate					
Days >10,000cfs	14	3	4	4	
Days >8,000 cfs	23	8	11	11	
Days >5,000 cfs	46	28	31	31	
Days >2,500 cfs	82	67	54	54	
Meets Flow Recommendations	Yes	No	Yes	Yes	

Source: Keller-Bliesner, 2005.

¹ As simulated for baseline depletion conditions and Navajo Dam operated to meet Flow Recommendations.

² Baseline depletions plus project depletion of 35,892 acre-feet. NIIP depletions reduced from 280,600 to 247,000 acre-feet. Navajo Dam operated to meet the Flow Recommendations.

The SJRPNM Alternative would affect aquatic resources by diverting water, disturbing riparian and aquatic invertebrate habitat, and entraining native fish. This alternative would divert 33,118 acre-feet of water from the San Juan River at RM 167 via a pump with an intake of 60 cfs. A portion of this water (1,871 acre-feet) would be returned downstream of Shiprock, New Mexico. An additional 4,645 acre-feet would be diverted from Navajo Reservoir via the existing NIIP facilities to Cutter Reservoir to supply the eastern pipeline. Mean average flows in the river would be increased by 4.6 cfs to meet project demands; minimum flows would decrease by 1.6 cfs, and maximum flows would increase by 25.2 cfs (Bliesner, 2003). The intake pump would be constructed adjacent to the San Juan River, and the pipeline would cross the river. Aquatic invertebrate habitat might be temporarily affected by substrate disturbance associated with construction. Mean reservoir elevations would increase by 1.3 feet under the SJRPNM Alternative, but are predicted to result in no measurable effect on the fish community in Navajo Reservoir.

A portion of the native fish population would be vulnerable to entrainment and impingement with intake facilities associated with the SJRPNM Alternative. An estimated 8.3 percent of flannelmouth sucker and 10 percent of speckled dace in the San Juan River are found upstream of the proposed intake structure (Propst et al., 2003). The fraction of these fish subject to entrainment depends on screening and the location of the intake. In the process of recovery, Colorado pikeminnow, razorback sucker, and bluehead sucker may also become entrained within project facilities, as is discussed in the “Special Status Species” section of this chapter.

Under the SJRPNM Alternative, the intake pump would be screened at 3/32 inch to minimize fish entrainment. This screen size is already a standard on all Upper Colorado River Basin diversions and is designed to exclude 20–30 millimeter larval fish. To avoid impingement, screens would be designed such that approach velocities do not exceed 0.5 cfs.

The SJRPNM Alternative has the potential to affect the composition of the native fish community through entrainment of flannelmouth sucker and speckled dace. Based on electrofishing population estimates from 1991–2002, 8.3 percent of the flannelmouth sucker population is located upstream of the proposed intake. Both native suckers spawn during the late spring and early summer (May–June). Average flows at Farmington during 1993–2003 were 5,011 cfs (USGS, 2003). The proposed SJRPNM Alternative would withdraw 60 cfs or 1.2 percent of San Juan River flows during the period of peak drift. Bluehead sucker exit the drift at 15 millimeters, and flannelmouth sucker exit the drift at 20 millimeters. Thus, all drifting larvae would be vulnerable to entrainment. Based on flows, 1.2 percent of the drift produced upstream of the proposed diversion would be entrained. This amounts to 0.10 percent of flannelmouth sucker larvae produced in the San Juan River between Navajo Dam and Lake Powell (ESRI, 2003b).

Based on seine sampling from 1998–2001, 10 percent of the speckled dace population in the San Juan River is located upstream of the proposed intake (Propst et al., 2003).

Speckled dace primarily spawn during the late spring and early summer (May–June), although limited, late-season spawning has also been documented on the San Juan River (Platania et al., 2000). Average early summer flows at Farmington during 1993–2002 were 5,011 cfs (USGS, 2003). The proposed SJRPNM intake would withdraw 60 cfs or 1.2 percent of San Juan River flows during the period of peak speckled dace drift. Speckled dace exit the drift at 12 millimeters; thus, all drifting larvae would be vulnerable to entrainment. Based on flows, 1.2 percent of the drift produced upstream of the proposed diversion would be entrained. This amounts to 0.12 percent of the speckled dace larvae produced in the San Juan River between Navajo Dam and Lake Powell (ESRI, 200b). When late-season spawning occurs, a greater portion of these larvae would be entrained because the proposed diversion comprises a greater fraction of flows during the late summer.

The entrainment losses of 0.10 percent flannelmouth sucker larvae and 0.12 percent speckled dace larvae under the SJRPNM Alternative are not considered significant and are not predicted to result in significant changes in the native fish community.

The SJRPNM Alternative has no foreseeable adverse effects on trout habitat below Navajo Dam. This alternative would not disturb any benthic or riparian habitat within the designated sport fishery. Slight increases in flows associated with project demands are not expected to adversely affect trout and may be beneficial, especially during extreme low-flow conditions.

NIIP Amarillo Alternative.—The NIIP Amarillo Alternative was modeled by taking a diversion/depletion of 37,763/35,892 acre-feet at the NIIP diversion on Navajo Reservoir. Flows of 1,871 acre-feet would be returned downstream of Shiprock, New Mexico. The NIIP depletion was reduced to 242,000 acre-feet to ensure that the Flow Recommendations are satisfied. An additional 6,300 acre-feet of NIIP groundwater accumulation was included.

The NIIP Amarillo Alternative would impact the Flow Recommendations more than the SJRPNM Alternative. Less water would be available in Navajo Reservoir to meet the Flow Recommendations because all project water would come from Navajo Reservoir.

The NIIP Amarillo Alternative includes no new intake structures and poses no entrainment risk to native fish. Changes in flow and mean reservoir elevation (0.9-foot increase) would be imperceptible and would not be expected to affect aquatic conditions or result in changes in the composition of the native fish community or the fish community in Navajo Reservoir.

The NIIP Amarillo Alternative when compared to the No Action Alternative would have no measurable effect on the native fish community or trout habitat below Navajo Dam. This alternative is not predicted to disturb trout, aquatic invertebrates, or aquatic habitat on the San Juan River, although slight decreases in flows may occur.

Aquatic Resources – Mitigation Measures

No mitigation measures are proposed for aquatic resources. Screening the PNM intake pump and implementation of BMPs as described in the “Water Quality” section would minimize project impacts to aquatic resources.

Aquatic Resources – Summary of Impacts

Both the SJRPNM and NIIP Amarillo Alternatives meet the critical elements of the Flow Recommendations. Under the SJRPNM Alternative, the Flow Recommendations are met 99.99 percent of the time. All but two flow criteria are met under the worst-case scenario, and these criteria have been determined by the SJRBRIP to be ineffective in accomplishing the anticipated effect (Miller, 2005). The 2,500 cfs criteria are missed by about 12 percent for 3 days in 1 year out of the 65-year analysis period. The NIIP Amarillo Alternative meets the Flow Recommendations slightly less often. Both alternatives are predicted to result in no measurable change to the fish community in Navajo Reservoir.

The SJRPNM Alternative has potential benefits to the downstream native and tailwater trout fisheries with increases in average monthly flows of 4.6 cfs (average over five gauging stations (Bliesner, 2003)). Entrainment losses of 0.48 percent bluehead sucker larvae, 0.10 percent flannelmouth sucker larvae, and 0.12 percent speckled dace larvae under the SJRPNM Alternative may occur but are not considered significant and not predicted to result in significant changes in the native fish community.

Withdrawals for the NIIP Amarillo Alternative would decrease mean monthly flows in the San Juan River by 4 cfs (average over five gauging stations (Bliesner, 2003)). When compared to the No Action Alternative, the NIIP Amarillo Alternative would have no impact on native or tailwater trout fisheries. Changes in flows would generally be imperceptible under both the SJRPNM and NIIP Amarillo Alternatives because of the 10-percent margin of error at the gauges.

Special Status Species

This section addresses the potential impacts to threatened and endangered species and species of concern (or special status species) that could result from actions associated with the alternatives considered.

Issue: How do the No Action, SJRPNM, and NIIP Amarillo Alternatives affect special status species?

Overview

Scope

The scope of analysis includes the area along the San Juan River corridor to near Lake Powell, south to the city of Gallup, east to the Star Lake area, and north from there to the Navajo Dam and Reservoir area.

Impact Indicators

The indicators applicable to the special status species parameter are whether the proposed action would cause impacts to threatened or endangered species and species of concern or their habitats.

Special Status Species – Affected Environment

Special status species include threatened or endangered species listed and protected under the ESA of 1973 or the Navajo Nation Endangered Species Act (NESA) and species of concern for which further information is needed to determine their conservation status.

The Service identified 6 endangered, 4 threatened, 2 candidate¹⁶ species, and 22 species of concern¹⁷ that could exist within the proposed project area (letter from the Service to Bliesner, November 24, 2003) (table V-10). Threatened or endangered species are listed as such under section 7 of the ESA.

The Navajo Natural Heritage Program (NNHP) (2003) also provided a list of species that may occur within the proposed project area and that are protected under the NESA.¹⁸ The NFWD will actively seek information on these species to determine if they warrant inclusion in a different group or removal from the list.

¹⁶ Candidates are species for which the Service has sufficient information on their biological status and potential threats to propose them as endangered or threatened, but the species have yet to be formally listed.

¹⁷ Species of concern are suspected by the Service to be vulnerable, but require further study to determine their conservation status.

¹⁸ Species listed under Group 1 of the NESA are those species or subspecies that no longer occur on the Navajo Nation. The NESA Group 2 listed species are any species or subspecies that is in danger of being eliminated from all or a significant portion of its range on the Navajo Nation. The NESA Group 3 listed species are any species or subspecies likely to become an endangered species, within the foreseeable future, throughout all or a significant portion of its range on the Navajo Nation. The NESA Group 4 listed species are any species or subspecies for which the NFWD does not currently have sufficient information to support their being listed in Group 2 or Group 3 but has reason to consider them.

Table V-10.—Threatened or endangered species (section 7)

Common name	Scientific name	Species status		Potentially adversely affected by alternative		
		Federal ¹	Navajo ²	No Action	SJRPNM	NIIP Amarillo
Wildlife						
American peregrine falcon ³	<i>Falco peregrinus anatum</i>	SC	Group 4	No	No	No
Arctic peregrine falcon ³	<i>Falco peregrinus tundrius</i>	SC	Group 4	No	No	No
Black-footed ferret ³	<i>Mustela nigripes</i>	E	Group 2	No	No	No
Baird's sparrow ³	<i>Ammodramus bairdii</i>	SC		No	No	No
Bald eagle	<i>Haliaeetus leucocephalus</i>	T ⁴		No	Yes	No
Black tern ³	<i>Chlidonias niger</i>	SC		No	No	No
Canada lynx ³	<i>Lynx canadensis</i>	T		No	No	No
Ferruginous hawk	<i>Buteo regalis</i>	MBTA	Group 3	No	Yes	Yes
Golden eagle	<i>Aquila chrysaetos</i>	EPA	Group 3	No	Yes	Yes
Kit fox	<i>Vulpes macrotis</i>		Group 4	No	Yes	Yes
Mexican spotted owl ³	<i>Strix occidentalis lucida</i>	T	Group 3	No	No	No
Mountain plover	<i>Charadrius montanus</i>	SC		No	No	No
Mule deer	<i>Odocoileus hemionus</i>		SCES	No	Yes	Yes
Northern goshawk ³	<i>Accipiter gentilis</i>	SC		No	No	No
Northern leopard frog ³	<i>Rana pipiens</i>		Group 2	No	No	No
Pronghorn	<i>Antilocapra americana</i>		Group 3	No	Yes	Yes
Rocky Mountain elk	<i>Cervus elaphus nelsoni</i>		SES	No	No	No
Sora ³	<i>Porzana carolina</i>		Group 2	No	No	No
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	Group 2	No	Yes	No
Townsend's big-eared bat ³	<i>Corynorhinus townsendii</i>	SC		No	No	No
Western burrowing owl	<i>Athene cunicularia hypugea</i>	SC		No	Yes	Yes
Yellow-billed cuckoo ³	<i>Coccyzus americanus</i>	CS		No	No	No
Fishes						
Bluehead sucker	<i>Catostomas discobolus</i>		Group 4	No	Yes	No
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	E	Group 2	No	Yes	No
Mottled sculpin	<i>Cottus bairdi</i>		Group 4	No	Yes	No
Razorback sucker	<i>Xyrauchen texanus</i>	E	Group 2	No	Yes	No
Roundtail chub	<i>Gila robusta</i>	SC	Group 2	No	No	No
Zuni bluehead sucker ³	<i>Catostomus discobolus</i>	CS	Group 4	No	No	No
Insects						
New Mexico silverspot butterfly ³	<i>Speyeria nokomis nitocris</i>	SC		No	No	No
San Juan checkerspot butterfly	<i>Euphydryas anicia chuskae</i>	SC		No	No	No

Table V-10.—Threatened or endangered species (section 7) (continued)

Common name	Scientific name	Species status		Potentially adversely affected by alternative		
		Federal ¹	Navajo ²	No Action	SJRPNM	NIIP Amarillo
Vegetation						
Acoma fleabane ³	<i>Erigeron acomanus</i>	SC		No	No	No
Beautiful gilia	<i>Gilia formosa</i>	SC		No	Yes	Yes
Bisti fleabane ³	<i>Erigeron bistinensis</i>	SC		No	No	No
Brack hardwall cactus ³	<i>Sclerocactus cloveriae</i> <i>ssp. brackii</i>	SC		No	No	No
Gooding's onion ³	<i>Allium goodingii</i>	CS		No	No	No
Knowlton cactus ³	<i>Pediocactus knowltonii</i>	E		No	No	No
Mancos milkvetch ³	<i>Astragalus humillimus</i>	E	Group 2	No	No	No
Mesa Verde cactus	<i>Sclerocactus mesae-verdae</i>	E	Group 3	No	Yes	Yes
Naturita milkvetch ³	<i>Astragalus naturitensis</i>		Group 4	No	No	No
Parish's alkali grass ³	<i>Puccinellia parishii</i>	CS*		No	No	No
Santa Fe cholla ³	<i>Opuntia viridiflora</i>	SC		No	No	No
Sivinski's fleabane ³	<i>Erigeron sivinskii</i>	SC		No	No	No
Zuni fleabane ³	<i>Erigeron rhizomatus</i>	T	Group 2	No	No	No

¹ Federal: CS = candidate species, CS* = candidate species (proposed endangered), E = endangered, EPA = Eagle Protection Act, MBTA = Migratory Bird Treaty Act, SC = species of concern, T = threatened.

² Navajo: Group 2 = in danger of being eliminated, Group 3 = likely to become an endangered species, Group 4 = does not have sufficient information to support their being listed in Group 2 or Group 3.

³ The areas affected by the proposed project lack suitable habitat for these species.

⁴ Delisted on August 9, 2007; 72 FR 37345.

Special Status Wildlife Species.—The proposed project lacks suitable habitat for peregrine falcon, black-footed ferret, Baird's sparrow, black tern, Canada lynx, Mexican spotted owl, Northern goshawk, Northern leopard frog, and Townsend's big-eared bat; therefore, all alternatives are predicted to have no effect on these species. Species potentially impacted by the project alternatives are discussed below. Species' occurrences are shown in figure V-5.

Bald Eagle.—The bald eagle (*Haliaeetus leucocephalus*) was delisted (removed) under the ESA in 2007. However, the species continues to receive protection under the Bald Eagle Protection Act of 1940, as amended.¹⁹ This large raptor catches fish principally, but also feeds on carrion, waterfowl, and rabbits. Bald eagles are found primarily near seacoasts, rivers, reservoirs, and lakes.

¹⁹ 16 U.S.C. §§ 668-668d, June 8, 1940, as amended 1959, 1962, 1972, and 1978.

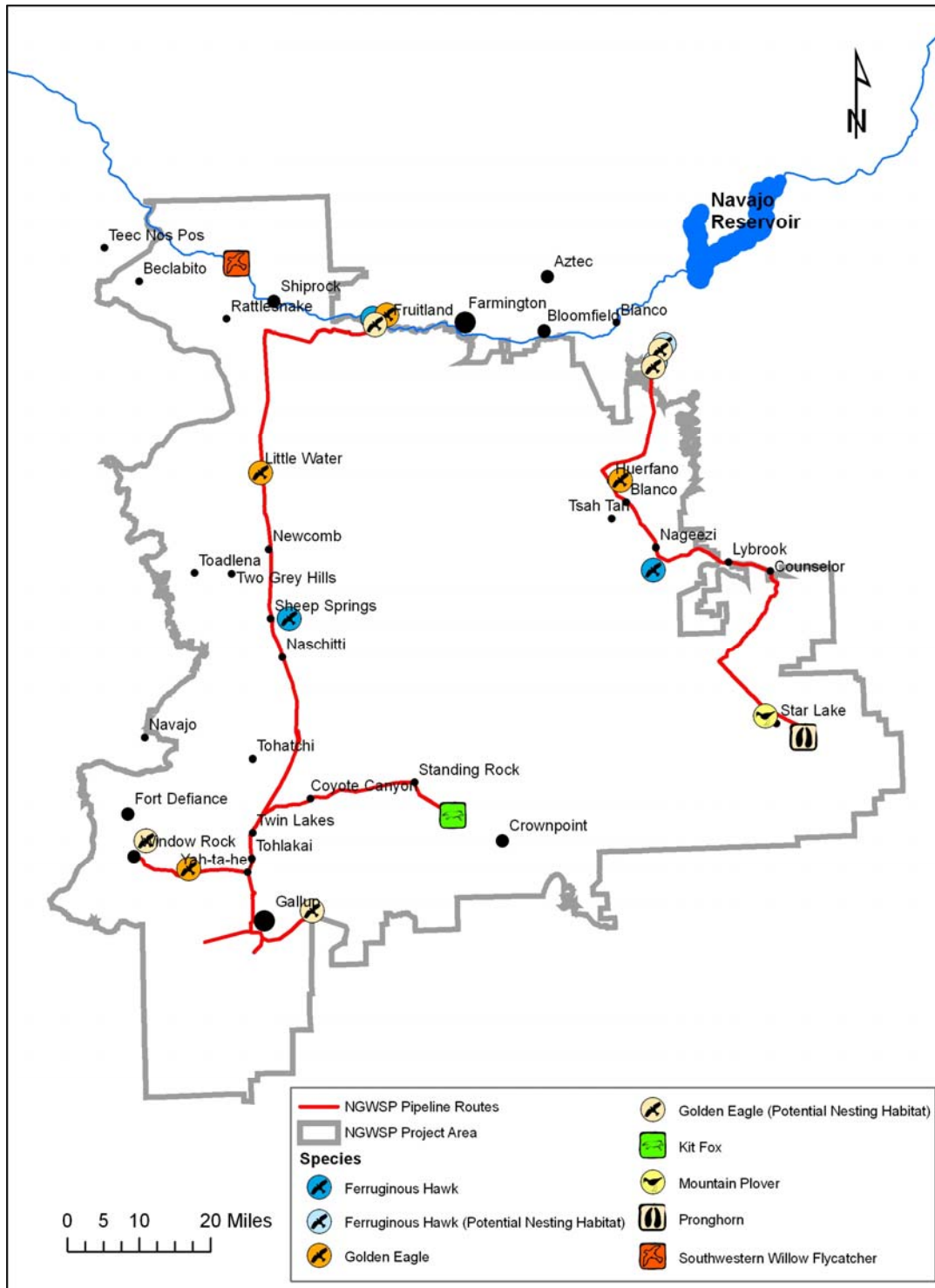


Figure V-5.—Special status wildlife within the proposed project area.

Ferruginous Hawk.—The ferruginous hawk (*Buteo regalis*) is a Navajo Nation endangered species (Group 3). Ferruginous hawks are found on semiarid plains and in arid steep habitats and favor relatively unbroken terrain. They prefer tall trees for nesting, but will use a variety of structures including mounds, short cliffs, cutbanks, low hills, haystacks, and human structures. Ferruginous hawks feed on ground squirrels, rabbits, pocket gophers, kangaroo rats, mice, voles, lizards, and snakes. Populations are adversely influenced by agricultural activities (DeGraaf et al., 1991).

The ferruginous hawk occurs in low numbers in the northwest corner of New Mexico. Two ferruginous hawks were observed during field surveys for the proposed project (ESRI, 2002). One was seen hovering over the sagebrush flats southwest of Nageezi, New Mexico, and another was observed over the plains east of Sheep Springs, New Mexico. No nests were observed, although suitable areas may occur several miles east-southeast of Sheep Springs and along cliffs in Blanco and Cutter Canyons. NNHP records ferruginous hawks within 3 miles of the proposed project pumping and water treatment facilities and within 1 mile of the Cutter Lateral pipeline route (NNHP, 2003).

Golden Eagle.—The golden eagle (*Aquila chrysaetos*) is a Navajo Nation endangered species (Group 3) and is also protected under the Bald Eagle Protection Act. Golden eagles are found in mountainous areas, canyons, grasslands, and shrublands and reside primarily in shrub-steep habitats during the winter. They nest in large trees and on cliffs. Breeding success is often highly dependent on prey densities. Primary prey includes jackrabbits, larger rodents, birds, and reptiles (DeGraaf et al., 1991).

One golden eagle nest is known historically from the ridge of the Nutria Monocline about 0.3 mile north of the proposed project pipeline. During recent surveys, a golden eagle was observed in flight along the San Juan River north of the San Juan Chapter and several were spotted along the SJRPNM pipeline route (ESRI, 2002). Although no active nests were detected during recent surveys, several areas of suitable nesting habitat are found in the proposed project vicinity. Large cottonwood trees near the SJRPNM's Hogback-San Juan River pipeline crossing may provide nesting habitat. The Defiance Monocline near Window Rock, Arizona, and the Nutria Monocline east of Gallup, New Mexico, may provide cliff-nesting habitat. NNHP records show golden eagles within 1 mile of the proposed pipeline along the western lateral near Little Water, New Mexico, the eastern Cutter Lateral near Huerfano, New Mexico, and the distribution lateral to Window Rock (NNHP, 2003).

Kit Fox.—The kit fox (*Vulpes macrotis*) is a Navajo Nation Group 4 species. Recent taxonomic studies include the kit fox as a subspecies of the swift fox (*Vulpes velox macrotis*). This subspecies inhabits arid grass and scrubland primarily, but may use woodland habitats. NNHP records show kit fox within 1 mile of the distribution lateral to Crownpoint, New Mexico. No signs of kit fox or fox were observed during surveys of

the proposed project area (ESRI, 2002). Potential habitat occurs throughout much of the proposed project area wherever soils are adequate for denning and small mammals are abundant (NNHP, 2003).

Mountain Plover.—The mountain plover (*Charadrius montanus*) is a Federal species of concern and a Navajo Nation Group 4 species. The mountain plover breeds in northeastern New Mexico and is only an incidental visitor in western New Mexico (BISON-M, 2002), although sightings have been documented within 1 mile of the proposed pipeline in the Star Lake, New Mexico, area (NNHP, 2003).

Mule Deer.—The mule deer (*Odocoileus hemionus*) is listed by the Navajo Nation as an economically and culturally significant species and is found within the proposed project area.

Pronghorn.—Pronghorn (*Antilocapra Americana*) are listed by the Navajo Nation as a Group 3 species. They are known from within 3 miles of the southern tip of the Cutter Lateral, and suitable habitat is found along the southern portions of the Cutter and Main Laterals (NNHP, 2003).

Rocky Mountain Elk.—The Rocky Mountain elk (*Cervus elaphus nelsoni*) is economically significant to the Navajo Nation. Although once found over much of North America, elk now range primarily through the Rocky Mountains from northern Alberta to New Mexico and Arizona (Whitaker, 1980).

Southwestern Willow Flycatcher.—The Southwestern willow flycatcher (*Empidonax traillii extimus*) is listed as federally endangered and listed by the Navajo Nation as a Group 2 species. The flycatcher's range includes the Basin, but designated critical habitat does not include this drainage, nor was critical habitat proposed for the drainage (Service, 1993).

Within the San Juan River drainage, populations of breeding flycatcher appear to have been quite small for many years. Woodsbury (1961) lists the flycatcher as a summer resident based on a single observation of a singing and feeding individual along the Piedra River in early July 1960. Schmitt (1976) lists the species as "occasional" at Kirtland, but overlooked and/or misidentified and thought to breed. Ecosphere, Inc. (2001) conducted presence-absence surveys along the San Juan River from Navajo Dam downstream to the confluence with Red Wash at about RM 132 in 1997, 1998, and 1999. One nesting pair producing one fledgling was identified in the flood plain along the San Juan River near the mouth of Malpais Arroyo (RM 142) in 1997. In addition, 14 undifferentiated flycatchers were identified on 12 of 24 sites surveyed.

In 1998, four nests were found in the same location, with four flycatchers fledged from three of the nests. An additional 18 undifferentiated flycatchers were identified in 10 of

27 sites. In 1999, no nesting pairs and no fledglings were found, although 31 flycatchers were found in 10 of 21 sites surveyed. In 3 years of surveying, 57 percent of the sites detected flycatcher at some time during the year, although only one site demonstrated nesting. Further, flycatchers were detected in exotic as well as native riparian habitat, although nesting was only detected in high quality, native willow habitat (Ecosphere, 2001). The bulk of these birds may be using the riparian corridor as a temporary stopover to replace resources spent during migration. Similar use of larger rivers as important refueling sites for flycatcher as they migrate between breeding grounds and wintering grounds has been described along the middle Rio Grande River (Yong and Finch, 1997).

Southwestern willow flycatchers are not necessarily restricted to willow/cottonwood complexes along larger rivers. They may also utilize suitable willow habitat away from these large rivers. Within the proposed project area, however, there is no suitable willow flycatcher habitat, nor has there historically been such habitat. This subspecies is not expected to use the proposed project service area.

Western Burrowing Owl.—The Western burrowing owl is listed as a Federal species of concern. No records of Western burrowing owl are known from the proposed project area. Crop production limits the suitability of some project habitats for Western burrowing owl; other open habitats may be used, depending on the availability of burrows.

Special Status Fish.— Species potentially impacted by the proposed project alternatives are discussed below. Species' occurrences were shown in figure V-5.

Zuni Bluehead Sucker – The Zuni bluehead sucker (*Catostomas discobolus yarrowi*) is a Federal candidate species and listed as a Navajo Nation Group 4 species. The historical range of the Zuni bluehead sucker, a subspecies of the bluehead sucker, is limited to the headwaters of the Little Colorado River and does not occur within the proposed project area.

Colorado Pikeminnow – The Colorado pikeminnow (*Ptychocheilus lucius*) is protected as both federally endangered and a Navajo Nation Group 2 species. Colorado pikeminnow spawn from early July through mid-August. Preferred spawning sites are riffles with gravel to cobble substrates (Lamarra et al., 1985). The Colorado pikeminnow is endemic to the Colorado River Basin and historically inhabited the main river channels. It is now found in small numbers only in limited portions of the upper Colorado River Basin in Colorado, Utah, and New Mexico, occupying about 25 percent of its former range. Within the San Juan River, the Colorado pikeminnow has been collected from RM 0 to RM 177.1 (see figure V-5) (Ryden, 2000a and 2000b).

Critical habitat for the Colorado pikeminnow is designated as the 100-year flood plain of the San Juan River from Neskahai Canyon in Lake Powell to the confluence of the San Juan and Animas Rivers (see figure V-4). Several factors have contributed to the decline of Colorado pikeminnow in the San Juan River. Water development, in particular the construction of Navajo and Glen Canyon Dams, has limited access to important habitats and altered the hydrology to which the Colorado pikeminnow is adapted. Competition with and predation by non-native species may also play a role. Historical chemical eradication of native species in favor of non-native game fish may have affected the population locally.

Mark recapture²⁰ estimates place 19 wild adult Colorado pikeminnow in the San Juan River from RM 136.6 to RM 119.2 (Ryden, 2000a). Radio-tagged adults appear to have relatively small home ranges and primarily use habitats from RM 109 to RM 142. The exception to this trend was one fish that consistently used habitats immediately downstream of Bluff, Utah, at RM 80 (Ryden, 2000a). Spawning has been documented in a region of high channel complexity characterized by shifting gravel bars from RM 133.4 to RM 129.8 (Ryden, 2000a). Additional suitable spawning habitat has been identified at RM 178.7 and RM 168.4 (Bliesner, 2003). Prior to spawning, some adults have staged at the mouth of the Mancos River. Spawning dates range from July 8 to August 12 (Platania et al., 2000). Larval and juvenile Colorado pikeminnow have been collected from low-velocity shoreline and pocketwater habitats downstream of RM 130 (Ryden, 2000a).

Stocking of Colorado pikeminnow in the San Juan River began in 1996. In the San Juan River at RM 147.9 and RM 53, 827,000 larval Colorado pikeminnow were stocked. Overwinter survival was high (62.5–6.27 percent), and survival between Age-1 and Age-2 based on recapture rates neared 100 percent (Kimball et al., 2000). As a result of this initial success, an augmentation plan began in 2002 and called for stocking and monitoring 300,000 Age-0 Colorado pikeminnow at RM 180.2 and RM 158.6 for 7 years (Ryden and McAda, 2003). In addition to augmentation, ongoing recovery efforts include adult and larval fish monitoring, habitat and water quality monitoring, and control of non-native species.

In 2003, the fish passage at the PNM weir was finished and put into operation. During the summer of 2003, nine Colorado pikeminnow used the fish passage (Lapahie, 2004). In 2004 and 2005, four and nine Colorado pikeminnow, respectively, used the PNM fish passage (Lapahie, unpublished data). One of the goals of the SJRBRIP is the expansion of the range of Colorado pikeminnow and removal of barriers to migration (SJRBRIP, 1995). The removal of the Cudei diversion dam and construction of a fish passage at the Hogback diversion dam in 2001 and the documented use of the fish passage at the PNM weir has provided opportunity for and documented use of this upper portion of the San Juan River by Colorado pikeminnow, an important step toward recovery.

²⁰ Mark recapture estimates are population estimates based on the number of fish that are marked or tagged and recaptured over a series of samplings.

In 2005, 287 Colorado pikeminnow were collected during nonnative fish control activities in the lower San Juan River (Jackson, 2006). Population estimates ranged from 536–696 individuals. Captures of adult Colorado pikeminnow have diminished since the non-native fish control project began in 2002, and no adult Colorado pikeminnow were collected in 2005.

Based on spawning dates in the San Juan River, larvae typically enter the drift from mid-July to mid-August (Platania et al., 2000) and are passive in the drift for 3 to 6 days after emergence (Dudley and Platania, 2000). Therefore, larval Colorado pikeminnow spawned above the diversion would be subject to entrainment for about 35 to 40 days. Flows during this period average about 1,500 cfs at the Farmington gauge (1993–2003; USGS, 2003). The proposed San Juan River intake would divert about 4 percent (59 cfs) of the total river during peak Colorado pikeminnow drift. Colorado pikeminnow exit the drift at 0.55 inch and would not be excluded by a 3/32 inch screen (Platania et al., 2000). Thus, it is estimated that about 4 percent of the larvae spawned above the intake would be subject to entrainment. Since only 25 percent or less of the spawn is expected above the proposed diversion, the net loss is expected to be less than 1 percent of all Colorado pikeminnow larvae produced in the San Juan River.

Razorback Sucker – The razorback sucker (*Xyrauchen texanus*) is listed as federally endangered and as a Navajo Nation Group 2 species. Critical habitat for this species is designated as the San Juan River and its 100-year flood plain from Neskahai Canyon in Lake Powell to the Hogback diversion dam. The razorback sucker's range is limited to the Colorado River drainage. Currently, it occurs in portions of the Green River in Utah and the upper Colorado River in Colorado. The largest remaining wild population is in Lake Mohave, Arizona-Nevada. Beginning in 1994, razorback sucker were reintroduced in the San Juan River. This population is reproducing and larval/juvenile razorback sucker have been recaptured from RM 0 to RM 135 (Brandenburg et al., 2002). Stocked razorback sucker use a variety of habitats seasonally. During the cold, winter months they select areas of high habitat diversity. During June, when inundated vegetation is available, razorback sucker use these areas. From August through October, razorback sucker inhabit fast run habitats. Razorback sucker have been documented spawning near Aneth, Utah, at RM 152.2. Reproduction has been documented by the capture of larval razorback sucker since 1999, with substantial increases in capture rates since 1994 (Brandenburg et al., 2002).

Augmentation through stocking is the current focus of razorback sucker recovery efforts on the San Juan River. During the aforementioned 5-year stocking period, fewer fish were available than were called for in the augmentation plan (Ryden and McAda, 2003). Thus, the augmentation plan has been extended to include 11,400 Age-2 razorback suckers per year through 2011. The goal of this augmentation is to establish an adult population of 5,800 razorback suckers. Several grow-out ponds have been established, and more are being developed, to meet the demand of this stocking effort. Additional

recovery efforts include mimicry of a natural hydrograph, larval razorback sucker monitoring, control of non-native fish, habitat monitoring, and removal of barriers to fish passage.

Removal of the Cudei diversion and construction of fish passage structures at the Hogback and PNM diversion provide access above the upper end of the razorback sucker's designated critical habitat. Razorback sucker have been documented at the PNM fish passage in 2003 (Lapahie, 2004), indicating the use of the river above designated critical habitat and above the PNM diversion.

Roundtail Chub – The roundtail chub (*Gila robusta*) is listed as a Federal species of concern and by the Navajo Nation as a Group 2 species. It is found in the larger streams of the Colorado Basin from California and Wyoming south to Arizona, New Mexico, and Mexico.

Bluehead Sucker – The bluehead sucker (*Catostomus discobolus*) is listed as a Navajo Nation Group 4 species. It is widespread throughout the Colorado River Basin and is also found in Idaho, Wyoming, Nevada, and Utah in the upper Snake, Bear, Walker, and Weber River drainages (BISON-M 2002; Valdez, 1990). This sucker inhabits small streams to large rivers and prefers fast-moving water over rocky substrates and relatively cool, clear conditions (Woodling, 1985; McAda, 1977; Holden and Stalnaker, 1975).

Bluehead sucker are the second most abundant native species and the third most abundant fish overall in the San Juan River from RM 53 to RM 180 (Ryden, 2000a). The bluehead sucker is found in very limited numbers upstream of RM 205, where introduced trout are the dominant species (Wethington, 2002). The highest catch rates for bluehead sucker occur within Reaches 5 and 6; downstream of this area the catch-per-unit effort (CPUE) declines dramatically with each consecutive reach, and no bluehead sucker have been caught below RM 17 (Ryden, 2000a). Large juvenile and adult fish are most common within Reach 6. Downstream of Reach 6, juveniles make up more of the CPUE, although there is no longitudinal trend in size class (K. Lawrence, personal communication, 2003).

During the period of test flows from 1991–97 from Navajo Dam to more closely mimic a natural hydrograph, bluehead sucker CPUE decreased throughout most of the San Juan River. This trend was reversed in 1998 and 1999; the catch of bluehead sucker increased (Ryden, 2000b). Decreasing trends did not occur within Reach 6. CPUE of bluehead sucker increased from 1991 through 1999. At times, over one-half the total catch of bluehead sucker occurred within Reach 6 (Ryden, 2000a). Reach 6 appears to be an important spawning area, and the number of large bluehead sucker present here may provide an important prey base for Colorado pikeminnow (Holden, 1999).

Mottled Sculpin – The mottled sculpin (*Cottus bairdi*) is listed as a Navajo Nation Group 4 species. Mottled sculpin within the Colorado River drainage are considered a unique subspecies.

This species is infrequently collected in the San Juan River in part because most surveys have focused on the middle and lower portions of the river and boat electrofishing does not effectively sample this small, benthic species (K. Lawrence, personal observation). Even so, the mottled sculpin is probably not abundant in the San Juan River, and most specimens have been collected upstream of Hogback diversion (Ryden, unpublished data).

Special Status Plants.—The proposed project area lacks suitable habitat for the Federal and Navajo Nation sensitive species including the Acoma fleabane, bistie fleabane, Brack hardwall cactus, Gooding's onion, Knowlton's cactus, Mancos milkvetch, Naturita milkvetch, Parish's alkali grass, Santa Fe cholla, Sivinski's fleabane, and Zuni fleabane. Therefore, these species are not discussed in any detail in this section.

This section focuses on Federal and Navajo Nation sensitive plant species that may be adversely affected by the proposed project (figure V-6).

Beautiful Gilia – Beautiful gilia (*Gilia formosa*) is a Federal species of concern and is found only in San Juan County on soils derived from the Nacimiento Formation. Beautiful gilia is also known as Aztec gilia. It grows in association with desert salt scrub communities at elevations from 5000 to 6000 feet (New Mexico Rare Plant Technical Council [NMRPTC], 1999).

Mesa Verde Cactus – The Mesa Verde cactus (*Sclerocactus mesa-verdae*) is listed as a federally threatened species and as a Navajo Nation Group 3 species. It is found in San Juan County, New Mexico, and Montezuma County, Colorado (NMRPTC, 1999). Mesa Verde cacti grow in highly alkaline, gypsiferous soils on low, rolling hills formed by the Mancos and Fruitland shale formations at 4900 to 5500 feet. The growth of Shiprock, New Mexico, oil and gas development, and off-road vehicle use threaten populations of the Mesa Verde cactus (NMRPTC, 1999).

NNHP records indicate populations of Mesa Verde cactus within 1 mile of the proposed project main lateral (NNHP, 2003). During field surveys along the main pipeline lateral route adjacent to Route 491, fewer than 100 individual Mesa Verde cactus were documented in one population. The population is located south-southeast of the junction of Route 491 and Navajo Route N36 and is within the boundary of the proposed pipeline alignment. Three additional areas of potential habitat were documented: (1) south of the junction of Route 491 and Navajo Route N36 for approximately 15 miles to the vicinity of Little Water, New Mexico; (2) north of Route 491 and west of the Hogback; and (3) immediately east of the Hogback from the Amarillo Canal to Route 491. During the spring and early summer of 2002, additional surveys were conducted in these areas (ESRI, 2002). Approximately 150 acres were surveyed. No Mesa Verde cacti were

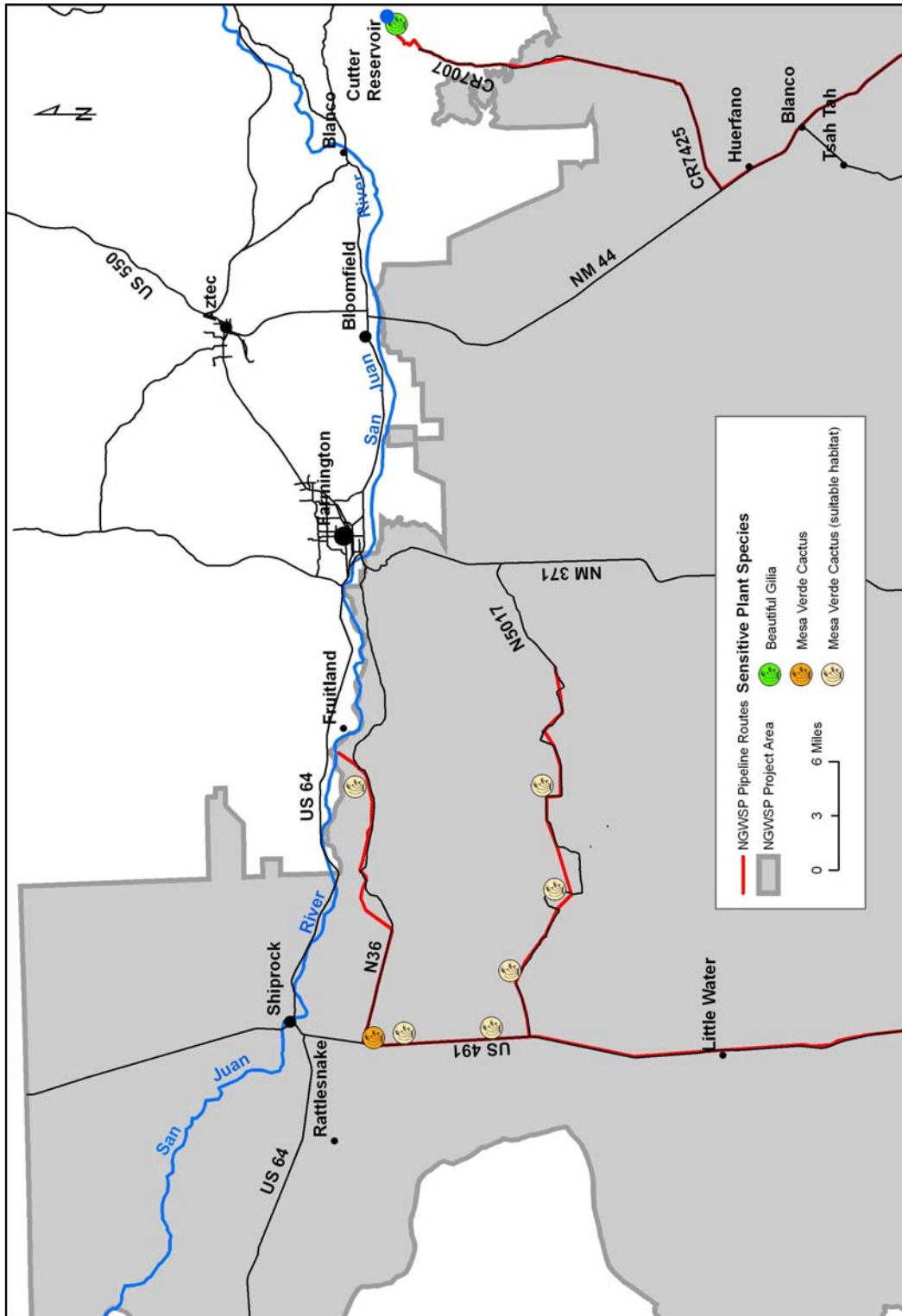


Figure V-6.—Special status plant species within the proposed project area.

observed; however, the area experienced a prolonged drought. During drought conditions, cacti recede into the ground and become very difficult to distinguish.

Special Status Species – Methodology

Special Status Wildlife.—Reports from the NMDGF, NNHP, and BISON-M were reviewed to compile descriptions of sensitive wildlife in the proposed project area. In addition, field surveys were conducted on approximately 290 miles of the proposed pipeline alignments. Each alignment was walked in increments along the centerline and wildlife observations were made on both sides. Binoculars and close visual inspections were used throughout the survey. All potential habitats for threatened and endangered wildlife were examined. Furthermore, sandstone cliffs, large trees, and utility structures within one-quarter mile of the proposed pipeline alignments were visually checked for raptor nests, perching, and roosting sites.

Both direct sightings and indirect evidence (tracks, dropping, burrows, and others) were used to document wildlife presence in the proposed project area (ESRI, 2002).

Special Status Fish.—Data previously collected by the SJRBRIP were used to evaluate impacts to special status fish. No field surveys were conducted.

Special Status Plants.—Reports from the NMGFD, NNHP, and BISON-M were reviewed to compile descriptions of sensitive plants in the proposed project area. In addition, field surveys were conducted on approximately 290 miles of the proposed pipeline alignment (for more information, see the description for “Special Status Wildlife” under “Special Status Species Methodology,” above).

Special Status Species – Impacts Analysis

The alternatives would have no potential impacts to the following special status species: mule deer, pronghorn, Rocky Mountain elk, mountain plover, and roundtail chub.²¹ There are potential impacts to the following special status species for both action alternatives:

²¹ Habitats are generally poor in the project area for Rocky Mountain elk, so they are expected to avoid these areas and any adverse impacts during construction activity. Although a limited number of roundtail chub have been documented above the proposed PNM intake, the roundtail chub is not expected to be impacted.

- Ferruginous hawk
- Golden eagle
- Kit fox
- Western burrowing owl
- Colorado pikeminnow
- Razorback sucker
- Beautiful gilia
- Mesa Verde cactus

No Action Alternative.—The No Action Alternative would have no impact on special status species in the proposed project area.

SJRPNM Alternative.— The SJRPNM Alternative would potentially impact three additional special status species—bald eagle, Southwestern willow flycatcher, and bluehead sucker. These species are briefly discussed below.

Bald Eagle – Under the SJRPNM Alternative, wintering eagles that feed in the San Juan River may be temporarily displaced by construction activity near the PNM diversion. These eagles would likely use other areas of the river and the proposed project area when equipment is idle.

Ferruginous Hawk – The SJRPNM and NIIP Amarillo Alternatives have the potential to affect ferruginous hawks. This species is known to nest within 1 mile of the proposed Cutter Lateral pipeline route, which is a common feature to both alternatives (NNHP, 2003). Construction activities in these areas may disrupt nesting and could lead to nest failures. Project operation is not expected to adversely affect the ferruginous hawk, and no nesting habitats will be damaged by the proposed project; thus, long-term effects are not anticipated.

Golden Eagle – The SJRPNM and NIIP Amarillo Alternatives have the potential to adversely affect the golden eagle. Golden eagles are known to nest within 1 mile of the proposed pipeline route (NNHP, 2003).

Kit Fox – The SJRPNM and NIIP Amarillo Alternatives have the potential to cause local effects on the kit fox. This species has been documented within 1 mile of the proposed pipeline alignment for the SJRPNM and NIIP Amarillo Alternatives.

Southwestern Willow Flycatcher.—Under the SJRPNM Alternative, construction activities at the PNM diversion may affect the Southwestern willow flycatcher. The impact area was surveyed in 1999 with no flycatchers found, although the habitat

determination was “good” (Ecosphere, 2001). However, much of the vegetation in the area rated as “good” was removed during the construction of the PNM fish ladder. Most of the remaining habitat is “marginal.” The SJRPNM Alternative may affect, but is not likely to adversely affect, the Southwestern willow flycatcher. This species is rare along the San Juan River. Less than an acre of exotic riparian shrub habitat would be removed for project structures, and approximately 17 acres of the same tamarisk habitat may be disturbed during construction. Monotypic tamarisk stands typically provide marginal habitat for the flycatcher, and it is unlikely that this species would be affected by project activities.

During higher flow periods when the Navajo Dam release is at its minimum, the flow below the PNM diversion would be slightly reduced (less than 0.5 percent on average) with negligible effect on potential habitat. Upstream of Navajo Dam, the average reservoir level would be slightly higher (about 2 feet) under project operation compared to baseline, with no difference in change between high and low flow levels each year. Further, inflow would be slightly higher as a result of the transfer of water from the JANNRWSP to the proposed project, so no impacts to Southwestern willow flycatchers above the reservoir are expected.

Western Burrowing Owl – The SJRPNM and NIIP Amarillo Alternatives have the potential to affect Western burrowing owl by project-related ground disturbance. This species was not observed during general wildlife surveys in the proposed project area; however, suitable habitat may be found along the proposed pipeline routes. Any Western burrowing owl nesting along the proposed alignments would be displaced by construction activity. Protective measures include conducting burrowing owl surveys within potential habitat prior to ground-disturbance activities. If active nests were found in the construction area, an appropriate mitigation plan would be developed.

Colorado Pikeminnow – Under the SJRPNM and NIIP Amarillo Alternatives, the critical elements of the Flow Recommendations would be met, as shown in table V-9 and as previously discussed in the “Aquatic Resources” Section. All but two of the flow criteria are met for the worst-case scenario, and these criteria have been determined by the SJRBRIP to be ineffective in accomplishing the anticipated results (Miller, 2005). Under the SJRPNM Alternative, the Flow Recommendations are met 99.99 percent of the time.

Although the SJRPNM Alternative meets the critical elements of the Flow Recommendations, it has the potential to adversely affect Colorado pikeminnow because entrainment of Colorado pikeminnow at the PNM intake might occur. Entrainment of adult and subadult Colorado pikeminnow is limited because of the incorporation of a 3/32-inch fish screen in the proposed project designs, but larval Colorado pikeminnow may still become entrained. While no spawning sites have been documented above this

diversion, the quality of gravel bars suggests spawning potential between the PNM diversion and Farmington, New Mexico (Bliesner, 2003). Given the known range of spawning and the availability of spawning habitat above the diversion, up to 1 percent of Colorado pikeminnow larvae may become entrained at the proposed San Juan River intake under the SJRPNM Alternative. While this impact would be adverse, it would be negligible. The SJRBRIP would continue to be implemented.

The San Juan River intake structure, pump, and pipeline would be constructed within designated critical habitat for Colorado pikeminnow, but no adverse modification of critical habitat is predicted. Flows upstream of the PNM weir would actually be greater with the proposed project than current baseline conditions, and water quality risks would remain low.

Razorback Sucker – Under the SJRPNM Alternative, the razorback sucker may also be adversely affected by the possible entrainment of larval fish during spawning. Spawning typically occurs on the ascending limb of the hydrograph during May (Brandenburg et al., 2002). With an assumed potential spawning range from Aneth, Utah, to Farmington, New Mexico (RM 100 to 180), and a uniform distribution of spawning adults in the future, about 16 percent of the larval drift may occur above the proposed PNM diversion. During May, the flow averages about 4,300 cfs, of which 59 cfs (1.4 percent) would enter the proposed project's PNM diversion under the SJRPNM Alternative. Not more than 0.2 percent of the nonretained drifting larvae are predicted to become entrained in the diversion. While this impact is adverse, it is also negligible.

Bluehead Sucker.—Under the SJRPNM Alternative, a portion of the bluehead sucker population would also be vulnerable to entrainment and impingement with intake facilities. Forty percent of Age-1+ bluehead sucker in the San Juan River are found upstream of the proposed intake structure (ESRI, 2003b). Up to 0.4 percent of drifting larval bluehead sucker in the San Juan River may be subject to entrainment. The predicted loss is also negligible. The SJRBRIP would continue to be implemented.

Beautiful Gilia.—The SJRPNM Alternative has the potential to adversely affect beautiful gilia. Approximately 100 plants are documented east of the proposed pipeline route centerline about 1,000 feet south of Cutter Dam (ESRI, 2002). These plants may be disturbed or displaced by the water treatment facility planned for the base of Cutter Dam. The pipeline exiting Cutter Dam may also disturb this population. Beautiful gilia populations on disturbed sites appear to recover over time (NMRPTC, 1999).

Mesa Verde Cactus.— The SJRPNM and NIIP Amarillo Alternatives have the potential to adversely affect the Mesa Verde cactus. The single population documented within the boundary of the main lateral and an associated pumping plant would be impacted (ESRI, 2002 and 2003c). Additional habitat is found along the main lateral, and several populations are found within a mile of the main lateral alignment (NNHP, 2003).

Section 7 Consultation.—Reclamation formally consulted with the Service on the SJRPNM Alternative, and a final biological opinion dated February 26, 2009, was issued for the proposed project (volume II, appendix C, part III). The opinion concludes that the 5,721 acre-feet of new depletions associated with the proposed project will not jeopardize the continued existence of the Colorado pikeminnow, razorback sucker, or Mesa Verde cactus, or adversely modify their designated critical habitat. The opinion includes an incidental take statement. Conservation and RPMs are discussed below.

NIIP Amarillo Alternative.—With the exception of sensitive fish and riparian-dependent species previously discussed, all other sensitive species effects would be similar to those described under the SJRPNM Alternative.

Because all project water would be delivered via the NIIP intake in Navajo Reservoir, there is no potential for entrainment of Colorado pikeminnow, razorback sucker, or bluehead sucker. No Southwestern willow flycatcher or bald eagle habitat would be affected under the NIIP Amarillo Alternative. Critical elements of the Flow Recommendations would be met, as previously discussed in the SJRPNM Alternative.

Special Status Species – Mitigation Measures

Potential mitigation measures to avoid or minimize impacts to affected sensitive species are discussed below. Conservative measures and RPMs included in the biological opinion (volume II, appendix C, part III) are also discussed.²²

- Proposed measures for ferruginous hawk and bald eagle include conducting surveys of the proposed construction areas 1 year in advance of construction for pipeline routes and construction sites that are not adjacent to highways, well-traveled roads, or areas of regular human activities. If active nests are found as a result of the surveys, appropriate protective measures could be developed to avoid or minimize nest disturbance.
- Construction could be managed to avoid intentional disturbance of dens for kit fox, as construction activities may discourage or disrupt denning activities.

²² RPMs are measures to reduce incidental take of threatened or endangered species defined in the biological opinion as terms and conditions. The terms and conditions are nondiscretionary actions required by the action agency and are not included as mitigation measures.

- Conservation measures for Southwestern willow flycatcher include surveying prior to construction suitable habitat within ¼ mile of the disturbed area and avoiding activity during the nesting period (March 15 to August 15) if the species is found. Any riparian vegetation removed may be replaced with appropriate native species, either onsite if the disturbance is temporary, or at an alternative location if the disturbance is permanent, as described in the “Vegetation Resources” section.
- Mitigation measures for beautiful gilia should include delineating and avoiding plants where possible.
- Conservation mitigation measures to protect existing populations of Mesa Verde cactus include:
 1. Prior to the completion of final design, Reclamation will inventory known populations and suitable Mesa Verde cacti habitat within 500 feet of the proposed pipeline alignment, pumping plant, and construction footprint. Because initial pre-engineering surveys were conducted in 2001 and 2002 during the drought, and because it will be many years between when the initial surveys were conducted and the project will be constructed, it is important that these areas be surveyed again.
 2. Based on the results of these inventories, Reclamation will develop a detailed Mesa Verde Cactus Construction Plan (Construction Plan) for the purposes of avoiding and minimizing disturbance to Mesa Verde cacti and suitable habitat to the greatest extent possible. The Construction Plan will be submitted to the Service and Navajo Nation for review. Specific locations of cacti will be kept confidential, and no Universal Transverse Mercator coordinates or similar location data will be included in the final report available to the general public.
 3. Construction areas, including pipeline alignments, pumping plants, temporary and permanent access roads, staging areas, etc., will be located in coordination with project engineers and Reclamation resource specialists to avoid individual cactus and habitat identified during the inventories. To the extent practicable, impacts to Mesa Verde cacti and/or suitable Mesa Verde cacti habitat will be minimized. Existing roads and previously disturbed areas (i.e., power lines, fence lines, prior construction staging areas) will be utilized, where possible, to minimize impacts. If temporary construction access roads are needed that will be situated closer than 50 feet from known individual cactus locations, these plants will be monitored during road use. The edges of these access roads will be flagged in the field.

4. When construction is complete, temporary access roads and staging areas within suitable Mesa Verde habitat will be closed and hand-raked to remove tire tracks. Because of the delicate nature of the soil structure in areas that support Mesa Verde cacti, no post-construction reseeding will be implemented in these areas.
5. Pre-construction surveys for Mesa Verde cacti will be conducted in the spring of the year preceding the initiation of construction activities to identify any new cacti. All areas that may be affected (directly or indirectly) by construction, operation, or maintenance of the pipeline and pumping plant will be surveyed. The locations of any additional cacti identified during the pre-construction surveys will be incorporated into the Construction Plan. Appropriate mitigation measures will be developed in consultation with the Service and the Navajo Nation if impacts to these new plants cannot be avoided.
6. Reclamation will develop an education program for all Reclamation field staff and all contractor employees regarding identification and conservation of the Mesa Verde cactus. The program will include information about the legal and biological status of the Mesa Verde cactus, the importance of habitat preservation, the occurrence of cactus and suitable habitat in the area, the Construction Plan, fines for damaging or removing cacti, and procedures for reporting cacti not previously identified.
7. All sites where Mesa Verde cacti are present will be fenced or flagged as detailed in the Construction Plan and monitored daily by Reclamation personnel when construction activities are ongoing in the vicinity. Fencing will extend 200 feet in both directions along access roads beyond the limits of each site. Where possible, fencing will include a 50-foot buffer around any known cacti during construction activities. All fencing will be inspected daily and maintained as needed to ensure adequate protection. All construction contracts will have “stop work clauses” if new cacti are discovered. Any disturbance to cacti observed by construction personnel will be reported immediately to Reclamation. A written account, including a map, extent of the disturbance, the number of cacti, and the circumstances surrounding the disturbance, will be submitted to the Service and Navajo Nation within 48 hours.
8. All traffic will be limited to routes specified in the Construction Plan via designated work area and access roads that were previously inventoried for Mesa Verde cacti. Cross-county travel within occupied and/or suitable Mesa Verde cactus habitat will be strictly prohibited.

9. To reduce the likelihood of noxious plants, cleaning of construction equipment will be required before entry into occupied or suitable Mesa Verde cacti habitat.
10. Routine post-construction inspections of the pipeline in suitable Mesa Verde cacti habitat will be performed using defined access roads. Additional surveys for Mesa Verde cacti in suitable habitat will be required prior to any ground- disturbing activity for maintenance. Survey results will be valid for 3 years.
11. Where features cannot be re-routed or moved to avoid impacts to an individual Mesa Verde cactus, the cactus will be transplanted in suitable habitat in cooperation with the Service and the Navajo Nation as described in the Construction Plan. Transplanted cacti will be monitored for a minimum of 5 years. Applicable permits from the Service and Navajo Nation will be obtained prior to transplanting Mesa Verde cactus.
12. Noxious weeds will be continually controlled within disturbed areas.

Conservation measures for the San Juan River and other water crossings to protect endangered fish and their designated critical habitat include:

1. Silt curtains, cofferdams, dikes, straw bales, or other suitable erosion control measures will be used to prevent erosion from entering water bodies during construction.
2. Water quality parameters will be monitored before, during, and after construction to ensure compliance with State Water Quality Standards. In-water work will stop if State Water Quality Standards are exceeded at or below the worksite due to construction activities.
3. Construction of the cofferdam will be scheduled during minimal low flows to avoid and minimize direct or indirect effects to fish species. Riverflows upstream and downstream of construction areas will be maintained. Fish passage around dewatered construction areas will be maintained at all times.
4. A fish net barrier will be installed upstream and downstream of the construction site during construction to exclude fish from the work area during periods of in-water work.
5. Reclamation will coordinate with the Service to have a biologist(s) onsite to rescue any fish species stranded as a result of construction activities.

6. Concrete pours will occur in forms and/or behind cofferdams to prevent discharge into the river. Any wastewater from concrete-batching, vehicle washdown, and aggregate processing will be contained and treated or removed for offsite disposal.
7. Fuels, lubricants, hydraulic fluids, and other petrochemicals will be stored and dispensed outside the 100-year flood plain in an approved staging area. Equipment will be inspected daily for petrochemical leaks. Construction equipment will be parked, stored, and serviced only at an approved staging area outside of the 100-year flood plain.
8. An oil spill response plan will be prepared for areas of work where spilled contaminants could flow into water bodies. All employees and workers, including those under separate contract, will be briefed and made familiar with this plan. The plan will be developed prior to initiation of construction. An oil spill response kit, which includes appropriate-sized spill blankets, shall be easily accessible and onsite at all times.
9. Onsite supervisors and equipment operators will be trained and knowledgeable in the use of spill containment equipment.
10. Appropriate Federal and State authorities will be immediately notified in the event of any contaminant spill.

Disturbed areas within the wetted channel will be covered with clean cobble or quarry stone from an upland source. Disturbed areas adjacent to the wetted channel will be stabilized and planted with native riparian vegetation.

The following RPMs were included in the incidental take statement of the biological opinion for the proposed project (volume II, appendix C, part III).

1. Reclamation will continue to support and participate in the implementation of the SJRBRIP.
2. Through the SJBRIP, Reclamation shall implement measures to create and maintain habitat complexity and to minimize loss and long-term degradation of habitat for the endangered fishes within the San Juan River.
3. To project future flow regimes in the San Juan River through the SJRBRIP, Reclamation will be responsible for the maintenance and application of the San Juan Hydrology Model to evaluate proposed projects on the San Juan River.

Terms and conditions described in the biological opinion to implement the RPMs include:

1. Reclamation will continue to seek and provide funding, as authorized, for the implementation of the SJRBRIP.
2. To create and maintain complex habitat, Reclamation, through the SJRBRIP, will:
 - a. Investigate the use of habitat manipulation such as non-native vegetation removal, mechanically opening the mouths of secondary channels, or reconnecting the river with the flood plain in appropriate sites to augment the function of high flows. Any resulting appropriate options should be implemented and funded through the SJRBRIP.
 - b. Continue to monitor habitat response to the Flow Recommendations.
 - c. Monitor the response of actions taken to increase habitat complexity.
3. To track potential climate changes and how these changes may affect the Colorado pikeminnow and razorback sucker and their designated critical habitats, Reclamation, in cooperation with the SJRBRIP, will begin monitoring to:
 - a. Determine changes in the timing of runoff.
 - b. Determine if average annual runoff is decreasing and a timeframe in which a change may affect the ability of the Flow Recommendations to be met.
 - c. If, from the monitoring activities listed above, it is determined that climate change is affecting water availability in the San Juan River, this would be considered new information that may affect listed species or designated critical habitat. Reclamation would reinitiate consultation with the Service, consistent with Section 7.0 D (2) of the “Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin” adopted by the SJRBRIP on June 19, 2001. Reclamation, in consultation with the Service, would evaluate the changes in water availability and determine if the changes would have an adverse effect on listed species and if the SJRBRIP is sufficient to serve as the reasonable and prudent alternative or measure.
4. To ensure the integrity, consistency, and scientific rigor in regards to water project depletions, Reclamation, working through the SJRBRIP, will:

- a. Continue maintenance and upgrades of the San Juan Hydrology Model using the best available science
- b. Conduct project analysis for water depletion projects on the San Juan River as needed

Special Status Species – Summary of Impacts

Both action alternatives have the potential to affect Colorado pikeminnow, razorback sucker, ferruginous hawk, golden eagle, kit fox, Western burrowing owl, beautiful gilia, and Mesa Verde cactus. However, implementation of mitigation, conservation, and RPMs would avoid or reduce impacts for most sensitive species. The SJRBRIP would continue to be implemented to recover Colorado pikeminnow and razorback sucker in the San Juan River.

The SJRPNM Alternative has the potential to affect three additional species: bald eagle, Southwestern willow flycatcher, and bluehead sucker. Formal consultation with the Service (volume II, appendix C, part III) determined that the SJRPNM Alternative will not jeopardize the continued existence of the Colorado pikeminnow, razorback sucker, or Mesa Verde cactus, or adversely modify their designated critical habitat. The Service concurred with Reclamation's determination that the SJRPNM Alternative would not result in adverse modification of designated critical habitat for the Colorado pikeminnow or razorback sucker. The opinion also includes an incidental take statement. Conservation and RPMs were discussed previously.

Recreation

This section addresses the potential impacts to recreation that could result from actions associated with the proposed project under the alternatives considered.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect recreation?

Overview

Scope

The recreation analysis includes Navajo Reservoir and the San Juan River corridor from Navajo Dam to the Clay Hills rafting take-out area near Lake Powell in the Glen Canyon National Recreation Area.

Impact Indicators

Impacts were measured using various indicators, including changes in:

- (1) Visitor recreation experience
 - (2) Traditional uses (e.g., fishing, camping, hunting, and rafting)
 - (3) Fishery habitat
 - (4) Riverflow levels
-

Recreation – Affected Environment

The study area is analyzed in four river segments and two general recreation areas (figure V-7): (1) Navajo Reservoir; (2) San Juan River corridor from Navajo Dam to Blanco, New Mexico; (3) San Juan River corridor from Blanco, New Mexico, to Montezuma Creek; (4) San Juan River corridor from Montezuma Creek to Clay Hills, Utah; (5) general recreation on the Navajo Nation lands within the proposed project area; and (6) general recreation on the Jicarilla Apache lands within the proposed project area.

Navajo Reservoir.—About 80 percent of Navajo Reservoir and its associated lands are located in New Mexico and approximately 20 percent in Colorado. The reservoir and lands that immediately surround it offer a variety of water-based recreation opportunities, at least one-half of which center on abundant fishing opportunities for a variety of fish, including bass, trout, crappie, northern pike, and kokanee salmon. As the lake waters warm in the summer, usage shifts to water-based sports such as water skiing. In recent years, there has been a noticeable increase in the number of family groups on summer vacation from Colorado visiting the reservoir. Other popular activities are boating, swimming, picnicking, camping, and, to a lesser degree, hiking, wildlife viewing, and hunting.

While the United States owns the reservoir and lands within the reservoir boundary, recreational uses are administered primarily by the Colorado Division of Parks and Outdoor Recreation and the New Mexico Department of Parks and Recreation (NMDPR). The parks are open year round, with seasonal closures in some areas to conserve natural and park resources.

Developed Recreation – Developed recreation facilities currently available for public use at Navajo Reservoir include swimming beaches, marinas, boat launch facilities, campgrounds, numerous picnic areas, and hiking trails. Extensive renovations of recreation facilities on the Colorado side were completed in 2002. Improvements

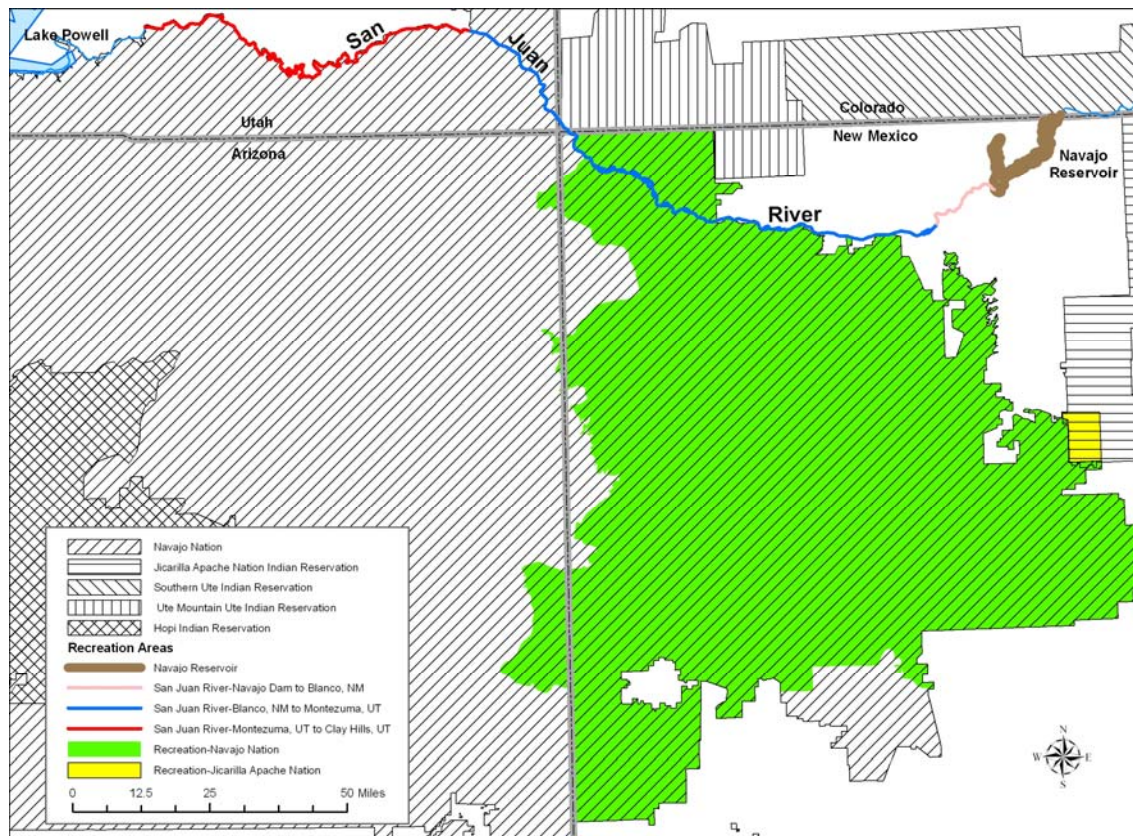


Figure V-7.—San Juan River segments and general recreation areas potentially affected by the proposed project.

included construction of a large parking lot, a new fishing access, 3 campgrounds totaling 110 sites, an enlarged amphitheater at the existing campground, additional picnic sites, rental cabins, a group-use area, and a new park headquarters.

Undeveloped Recreation – Concentrated use in Colorado occur at Arboles Point and several locations along the San Juan and Piedra arms of Navajo Reservoir. The San Juan and Piedra Rivers are both popular trout fishing areas. Kokanee salmon snagging is seasonally allowed within the Navajo Recreation Area. Designated roads provide easy vehicular access to parking areas near the reservoir from both the east and west sides of the Piedra arm, where day use (picnicking, fishing, and hiking) and primitive camping in designated areas regularly occurs throughout the summer recreation season.

In New Mexico, dispersed use occurs at many locations, with access provided by numerous roads developed for natural gas production. In addition, the many coves of the reservoir are attractive for camping and exploring by boat. Water skiing is allowed on most of the reservoir except in some of the canyons where the channel becomes too narrow or shallow to safely ski.

Park Visitation Levels – Visitation to Navajo Reservoir has increased by 61 percent since 1990, an average rate of 8.6 percent per year. In 1999, total visitation equaled 534,099 in the New Mexico portion of Navajo Reservoir. Boating and camping uses on the reservoir are concentrated within a 4-month period, while the San Juan River attracts heavy use on a year-round basis. Additional information on visitation levels, visitor profiles, visitor activities, and satisfaction levels can be found in the Navajo Reservoir Operations FEIS (Reclamation, 2006).

San Juan River.—

Navajo Dam to Blanco, New Mexico (Tailwater Trout Fishery) – Navajo Dam tailwater is a unique environment characterized by cobble substrate and cool hypolimnetic releases. The NMDGF manages the tailwater as a trout fishery from the base of Navajo Dam 17 miles downstream to Blanco, New Mexico. The upper 4 miles are managed as special trout water. Regulations within the first one-quarter mile require catch-and-release using only barbless flies and lures. The remaining 3.75 miles carry the same tackle restrictions, but anglers are allowed to keep one fish over 20 inches per day. Immediately downstream of the special trout water for 3.3 miles (to the confluence of the San Juan River and Gobernador Arroyo) are regular regulation waters. NMDGF imposes no tackle restrictions in this reach and allows a daily bag limit of five fish. The remaining 10 miles of river to Blanco, New Mexico, are under the same regulations, but are bordered by private land and less accessible to anglers (Wethington, 2002).

Hunting activities on the river are restricted to waterfowl and small game, while the surrounding areas offer opportunities such as camping, picnicking, hiking, wildlife viewing, and bird watching. Along this reach, day-use areas provide fishing access to the San Juan River and, in some cases, boating access.

No recreational boats are allowed for the first 1.5 miles below the dam; beyond that, float fishing is popular. In 2002, 43 outfitters and 89 guides were licensed to operate on this reach of the San Juan River (Reclamation, 2006). Outfitters are not limited on the number of days they can operate. Most outfitters (93 percent) that use dory boats put in at the Texas Hole Day-Use Area below Navajo Dam and take out at the Gravel Pit Day-Use Area at the end of the quality waters.

Annual NMDGF electrofishing surveys from 1997–2001 found an increasing percentage of brown trout in the special trout water and regular regulation reaches. Increases in brown trout numbers may be due to improved spawning success associated with high spring releases from Navajo Dam. The average length of rainbow trout from the special regulation waters was 15 inches, and on average, 18 percent of the rainbow trout were over 18 inches. In contrast, less than 2 percent of trout in the regular regulation waters

were over 18 inches; trout in regular regulation waters averaged 9 inches. Since then, NMDGF has managed the effects of whirling disease by stocking only fish 4 inches or larger (Wethington, 2002).

Further downstream, very good brown and rainbow trout fishing from Citizens Ditch to Hammond diversion (within Navajo Dam to the Blanco stretch of the San Juan River) exists. Because the river is bounded by private lands in this area, fishing data are not available. Within the quality waters along the San Juan River, over one-half of all visitors to the river were from out of State, primarily from Texas, Colorado, Arizona, or California. Only 25 percent of visitors to the river are of local origin. Downstream from the quality waters, out-of-State users have made up 8 to 15 percent of users in recent years. Total annual angler days in the first 7.5 miles of river varied from an estimated 44,000 to 61,000 between 1995 and 2001. The months of July through October have the highest use. Approximately 6,000 to 7,000 of these visitors use guides or outfitters (Reclamation, 2006).

The fishery in the lower 10-mile reach is maintained primarily through natural reproduction of brown trout. In 1992, the fish composition within this reach included 62 percent native species (flannelmouth sucker, bluehead sucker, and mottled sculpin). By 1998, this number had declined to less than 1 percent. Higher releases from Navajo Dam associated with the 199–97 Navajo Dam test flows may be causing this shift (Wethington, 2002).

NMDGF creel surveys found catch rates up to 1.23 fish per hour in the special trout waters; however, less than 1 percent of anglers had harvested a fish. Approximately 90 percent of the trout surveyed in these waters showed hooking scars. In contrast, over 90 percent of the fish over 8 inches caught in the regular regulation waters were harvested. Catch rates averaged 0.57 fish per hour. Creel data are not available for the lower 10-mile reach due to lack of access (Wethington, 2002).

Blanco, New Mexico, to Montezuma Creek, Utah – Below the trout fishing area that ends at the Hammond diversion, the San Juan River is not managed for recreation purposes by any public entity. The river is predominately flanked by private lands to just past Farmington, New Mexico, where it is bordered on the north by private lands and on the south by Navajo Nation lands. This land ownership pattern continues for several more miles until the river is adjoined on both sides by Navajo Nation lands. Recreation in this area is minimal; there is little fishing and float boating. Numerous water diversions in this reach make floating difficult and dangerous (Reclamation, 2006).

When the river enters Navajo Nation lands, recreation management is administered by the Navajo Nation Parks and Recreation Department (NNPRD). Although the NNPRD does not issue rafting permits or track rafting numbers, it does issue about 450 camping

and hiking permits annually for the river corridor at a cost of \$5 per permit. Besides camping and hiking, these visitors also fish for catfish. A lack of river access to the general public appears to limit rafting in this stretch.

Montezuma Creek, Utah, to Clay Hills, Utah – BLM has management responsibilities along the river for 104 miles from Montezuma Creek to Clay Hills, Utah, in conjunction with the Navajo Nation and the National Park Service (NPS). Most rafting occurs between the Sand Island launch site near Bluff, Utah, the Mexican Hat boat launch site near Mexican Hat, Utah, and the Clay Hills boat launch in the Glen Canyon National Recreation Area. The rafting access facilities at Clay Hills are affected by Lake Powell water levels and riverflows. In particular, large sediment deposits and low flows can make it very difficult to access the boat launch site.

BLM manages commercial trips by issuing permits based on historical use and allowing changes at the outfitters' request and within guidelines. At Sand Island, the commercial sector is allowed one to two launches per day. The core season for rafting companies is June through August. However, there is additional use during March through May and September and October. Private rafting is managed by requiring permits all year, and about 900 permits are issued each year. August to March permits are issued on a first-come, first-served basis, while lottery draws fill the launch calendar from mid-April to the end of July. Additional information on rafting use on this stretch of the San Juan River can be found in the Navajo Reservoir Operations FEIS (Reclamation, 2006).

General Recreation on Navajo Nation Lands – General recreation on the Navajo Nation is managed by the NNPRD. Recreation opportunities include hiking and camping on the Navajo Nation. For the protection of natural and cultural resources, the NNPRD has implemented guidelines for backcountry use. The trails are not improved or maintained and are usually marked with rock cairns. Most trails are rated strenuous to moderately strenuous. A number of trails and routes are used by hikers from the Little Colorado Gorge, from Cameron to the confluence with the Colorado River, Marble Canyon bordering the Navajo Nation from Lee Ferry to the confluence of the Little Colorado River; side canyons of the San Juan River bordering the Navajo Reservation from Sand Island (Montezuma Creek) to Paiute Farms Wash, and Rainbow Bridge trails around Navajo Mountain (NNPRD, 2005). Established recreation trails are limited within the proposed project area.

A backcountry permit fee of \$5 per person is required by the Navajo Nation. The Navajo Nation also issues camping permits at a rate of \$5 per person, per night. Dune buggies, jeeps, 4-wheel drive vehicles, and motorcycles are prohibited off established trails (NNPRD, 2005).

The NNPRD also manages Navajo Tribal Parks, which include (1) Monument Valley National Park, (2) Antelope Canyon, (3) Bowl Canyon Navajo Recreation Area, (4) Four Corners Monument, (5) Little Colorado Gorge Overlook, (6) Navajo Nation Zoo and

Botanical Park, (7) Window Rock Sports Center, and (8) the Veterans Memorial Park (NNPRD, 2005). Only the last three parks listed are within the proposed project service area and may receive domestic water from the proposed project.

Hunting, fishing, and boating activities on Navajo Nation lands are managed by the Navajo Nation Department of Fish and Wildlife (NNDFW). Limited hunting occurs within the proposed project area (NNDFW, 2005).

General Recreation on Jicarilla Apache Nation Lands – General recreation on Jicarilla Apache Nation lands is managed by the Jicarilla Game and Fish Department (JGFD). Activities include hunting, fishing, boating, and camping (JGFD, 2005). Fishing, camping, and boating activities are limited to the Navajo River and lake in the northeastern portion of the reservation. The Jicarilla Apache Nation manages a hunting and fishing program that provides hunting opportunities to Tribal and non-Tribal members. Hunting programs focus on mule deer, elk, mountain lion, black bear, and turkey and also are primarily restricted to the northern portion of the Jicarilla Apache Reservation. Hunting activities within the proposed project area of the reservation are limited to Tribal members.

Recreation – Methodology

Data used in this analysis were initially presented in the Navajo Reservoir Operations FEIS because more current information was not available in a complete form when this analysis was conducted. In addition, it was assumed that for all alternatives, based on historic trends, there would be:

- Continued increases in demand for fly fishing on the San Juan River below Navajo Dam
- Continued pressure on BLM to issue more river rafting use permits on the Lower San Juan River during the summer
- Increased Navajo Reservoir recreation (about 5 to 6 percent annually)
- An increased demand for recreation activities on Navajo and Jicarilla Apache Nation lands

Impacts were evaluated by developing baseline information, using the hydrologic model, modeling trout physical habitat, and extrapolating results from results of the 2001 Summer Low Flow Test and the 1996–97 Winter Flow Tests (Reclamation, 1998 and 2002b).

The development of baseline information came from researching the consulting Federal, State, Tribal, county, and city agencies; publications; and using existing information collected in the Navajo Reservoir Operations FEIS.

Recreation – Impacts Analysis

No Action Alternative.—Under the No Action Alternative, the following future resource conditions are predicted.

Navajo Reservoir Recreation – Under the No Action Alternative, average reservoir elevation reductions of approximately 10 feet are expected to occur during the recreation season (April through October). In dry periods, this fluctuation could average as much as 30 feet. Low water levels and accompanying exposure of mud flats, gravel bars, tree stumps, and rocks could reduce boating, fishing, and reservoir aesthetic values, especially in the Colorado portion where the waters are generally shallower.

River Recreation – Future conditions under the No Action Alternative predict reductions over time in trout habitat and decreased angling success. Downstream rafting recreation is also predicted to decrease under the No Action Alternative. Both the trout fishing and river rafting future conditions are discussed below.

Trout Fishing – Under future conditions for the No Action Alternative, flows immediately below Navajo Dam would eventually range from approximately 250 cfs to 500 cfs 70 percent of the time. Dory boat fishing becomes more difficult under these lower flow conditions, and wade fishing tends to increase. Conflict between wade and boat fishing may increase as use overlaps during low-flow periods. The existing and future conditions of the recreational fisheries resource are discussed in the “Aquatic Resources” section.

Under the No Action Alternative, it is predicted that some outfitters would continue float fishing trips at lower flows and use rubber or vinyl rafts that are able to float the river at these lower flows, representing a change from the more commonly used dory boats. When flows drop below 500 cfs (estimated at 63 percent of the time during high-use months), crowding or concentrating fishing use of popular locations is expected.

Actual fishing use depends on many factors: catch rate, size of fish, angler crowding, economic conditions, regional human population growth, and other considerations; therefore, it is not possible to accurately predict changes in fishing use. In the short term, it is anticipated that more shore or wade fishing would be substituted for a portion of dory boat use because of navigation problems.

Table V-11 shows estimated angler hours and days for both the quality and regular water below Navajo Reservoir from 1995–2001 (Wethington and Wilkenson, 2004). Under the No Action Alternative, predicted adult trout habitat reduction is assumed to result in fewer fish and reduced quality of the recreation experience and perhaps reduced angler use below Navajo Dam when compared to the 1995–2001 period. Trout habitat would be reduced 30 to 37 percent when dam releases decline from 500 to 250 cfs, average river

Table V-11.—Estimated angler use below Navajo Reservoir

Year	Quality waters		Regular waters		Total	
	Angler hours	Angler days	Angler hours	Angler days	Angler hours	Angler days
1995	160,909	32,181	47,910	11,977	208,819	44,158
1996	238,140	47,628	54,211	13,553	292,351	61,181
1997	213,324	42,664	54,985	13,746	268,309	56,410
1998	222,172	44,434	47,218	11,805	269,390	56,239
1999	243,842	48,768	46,737	11,684	290,579	60,452
2000	216,688	43,333	34,668	8,667	251,336	52,000
2001	175,053	35,010	36,051	9,013	211,110	44,023

Note: Data taken from Wethington and Wilkenson, 2004.

depth would be reduced by 4.5 inches and wetted perimeter by 5 to 10 percent, and while trout numbers are predicted to diminish significantly, they are not expected to decline in proportion to habitat reduction (Reclamation, 2006).

Reductions in angling below the quality waters to Blanco, New Mexico, when compared to the 1995–2001 period (table V-11) are also predicted under the No Action Alternative. This reduction would be proportionally greater than those expected in the quality waters to Blanco because of further reduced flows under the No Action Alternative.

Rafting – Optimum flow conditions for rafting under the No Action Alternative occur less frequently in the future because of reduced base flows. Optimum flows for rafting average 1,000 to 3,000 cfs, and most commercial rafters currently do not raft the river when flows drop below 500 cfs because of safety concerns and problems with river navigation. Between 500 and 800 cfs, commercial rafters can use smaller boats, but the smaller boats have reduced capacity and efficiency and therefore increase costs. The river, however, would remain floatable throughout the recreation season because one of the Flow Recommendations criteria is to maintain flows above 500 cfs for endangered fish habitat.

General Recreation on Navajo Nation and Jicarilla Apache Lands – The No Action Alternative would have no effect on general recreation activities on Navajo Nation and Jicarilla Apache lands. Hunting, fishing, hiking, and camping activities would continue. Other recreational developments would continue to be limited by the available water supply.

SJRPNM Alternative.—When compared to the No Action Alternative, there would be limited benefits to river recreation based on additional releases from Navajo Dam to meet the proposed project’s demands.

Reservoir Recreation – Under the SJRPNM Alternative, mean reservoir elevations would increase by 1.3 feet when compared to the No Action Alternative. However, in dry periods, reservoir elevation average fluctuations would be as predicted under the No Action Alternative. The SJRPNM Alternative is predicted to have no measurable impact on reservoir recreation.

River Recreation – River recreation would slightly benefit under the SJRPNM Alternative, and potential impacts associated with the SJRPNM Alternative are as follows:

Trout Fishing – The SJRPNM Alternative would provide additional flows in the San Juan River from Navajo Dam to the PNM diversion to meet project demands. This would result in up to an additional 40 cfs during drought conditions when natural flows were not able to meet the proposed project’s demand. Under extreme drought conditions, this would result in a 27- to 66-percent increase in summer flows (60 to 150 cfs increased to 100 to 190 cfs flows) below the Citizens Ditch. The SJRPNM Alternative would benefit the trout fishery by decreasing the frequency of flows that drop below 134 cfs downstream from Citizens Ditch when water quality parameters exceed tolerance limits for trout. Additional discussion is included in the “Aquatic Resources” section.

Rafting – The SJRPNM Alternative would have no measurable effect on downstream rafting recreation when compared to the No Action Alternative. All Flow Recommendations criteria would be met under this alternative, which would maintain base flows near Bluff, Utah, at 500 cfs or higher, maintaining minimum floatable flows to the Clay Hills takeout. In addition, the higher spring releases required to meet the Flow Recommendations would continue to flush accumulated sediments further into Lake Powell, making the river more floatable.

General Recreation on Navajo Nation Lands – The SJRPNM Alternative is predicted to have no adverse impacts on general recreation activities on Navajo Nation lands within the proposed project area. No campgrounds, hiking trails, or established recreation areas would be affected. Hunting activities are limited within the proposed project area due to the types of habitat that occur within the proposed project area (see the “Vegetation Resources” and “Wildlife Resources” sections).

An occasional Tribal member hunts small game or elk (NNDFW, 2005). Construction could temporarily displace wildlife game species, which could reduce hunting success; however, construction is not expected to significantly affect hunting opportunities on the Navajo Nation.

Existing Tribal parks within the proposed project service area (the Navajo Nation Zoo and Botanical Park, Window Rock Sports Center, and the Veterans Memorial Park) would likely benefit from a dependable domestic water supply. In addition, a dependable

domestic water supply would enable future recreational development within the proposed project area. However, no future plans to expand recreational features (camping, hiking, and others) within the proposed project area have been identified by the Navajo Nation.

General Recreation on the Jicarilla Apache Lands – The SJRPNM Alternative is predicted to have no adverse impacts on general recreation activities on Jicarilla Apache Nation lands within the proposed project area. No campgrounds, hiking trails, or established recreation areas would be affected. Hunting activities are limited within the proposed project area due to the types of habitat that occur within the proposed project area (see the “Vegetation Resources” and “Wildlife Resources” sections).

Dependable water supplies in the Jicarilla Apache Nation portion of the proposed project would allow the Jicarilla Apache to develop and promote recreational opportunities in this area; however, no recreational developments are planned as part of the proposed project.

NIIP Amarillo Alternative.—With the exception of river recreation, impacts to recreation resources under the NIIP Amarillo Alternative would be similar to those of the SJRPNM Alternative.

Reservoir Recreation – Under the NIIP Amarillo Alternative, mean reservoir elevations would increase by 0.9 foot; however, during dry periods, reservoir elevations’ average fluctuations would continue as described under the No Action Alternative. The SJRPNM Alternative is predicted to have no measurable impact on reservoir recreation.

River Recreation – River recreation impacts under the NIIP Amarillo Alternative would be similar to those under the No Action Alternative because no additional releases would be made from Navajo Dam to meet project demands.

Trout Fishing – The NIIP Amarillo Alternative would have no effect on trout fishing. Additional flows would not be released downstream of Navajo Dam to meet project demands because all water demands would be delivered through the NIIP system upstream of Navajo Dam.

Rafting –Rafting impacts are the same as those under the SJRPNM Alternative.

General Recreation on Navajo Nation Lands – Impacts to general recreation activities on the Navajo Reservation would be similar to those described for the SJRPNM Alternative.

General Recreation on Jicarilla Apache Lands – The impacts are the same as those for the SJRPNM Alternative.

Recreation – Mitigation Measures

No mitigation measures are proposed for the SJRPNM or NIIP Amarillo Alternatives.

Recreation – Summary of Impacts

The SJRPNM and NIIP Amarillo Alternatives are predicted to have no measurable effect on reservoir recreation or general recreation activities on the Navajo and Jicarilla Apache Nation lands. However, when comparing the SJRPNM Alternative to the No Action and NIIP Amarillo Alternatives, there would be some benefits to trout fishing below Navajo Dam under the SJRPNM Alternative based on additional releases via the San Juan River to meet project demands.

Land Use

This section addresses the potential impacts to land use that could result from actions associated with the proposed project under the alternatives considered.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect land use?

Overview

Scope

The scope includes lands in use from Navajo Dam and Reservoir downstream along the San Juan River to Lake Powell and the proposed project service area.

Impact Indicators

Irreversible changes in land use within the proposed project area.

Land Use – Affected Environment

Figure V-8 shows land ownership within the proposed project area. There are approximately 5,060,064 acres within the proposed project service area. These lands include privately owned lands, lands owned by the State of New Mexico, and lands owned by the United States (Federal lands). Federal lands include lands held by the BIA

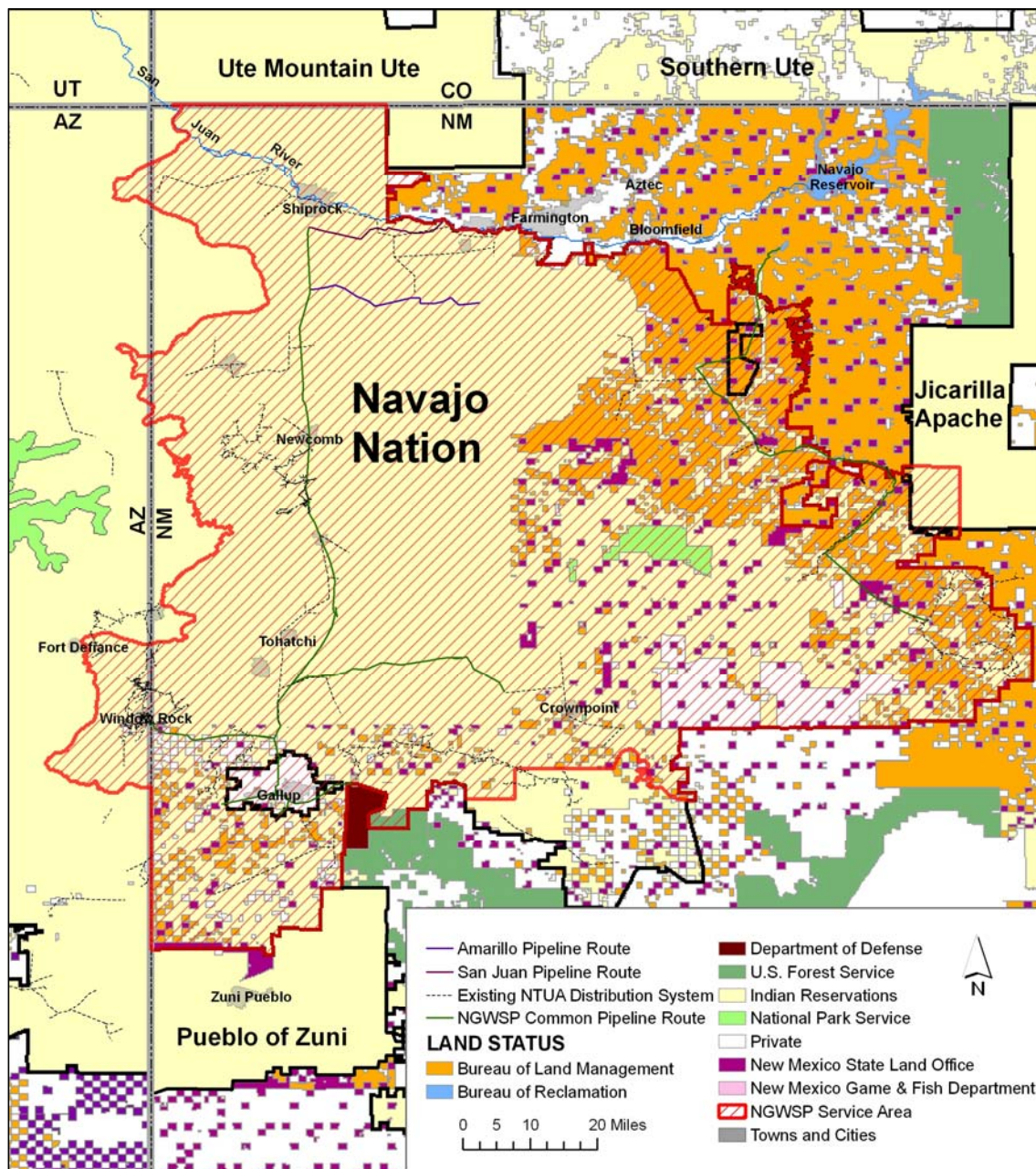


Figure V-8.—Land ownership within the proposed project area.

in trust for the Navajo and Jicarilla Apache Nations, as well as lands under the jurisdiction of BLM, the U.S. Forest Service, Reclamation, and the Department of Defense (table V-12). Major landowners within the proposed project service area include Federal lands held in trust by the BIA for the Navajo Nation (76 percent), Federal lands under the jurisdiction of BLM (14 percent), and private landowners in New Mexico (5 percent).

Table V-12.—Land ownership within the project area

Ownership	Acres	Percent
Navajo Nation – New Mexico	3,730,555	73
Navajo Nation – Arizona	140,891	3
BLM	680,014	13
Private – New Mexico	251,693	5
Private – Arizona	1,376	<1
State of New Mexico	179,666	4
NPS	34,199	<1
Jicarilla Apache Nation	33,954	<1
U.S. Forest Service	7,488	<1
Reclamation	164	<1
Department of Defense	64	<1
Total	5,060,064	

Navajo Reservoir.—Federal lands under the jurisdiction of Reclamation around and below Navajo Reservoir are managed for uses compatible with Navajo Dam and Reservoir (including mineral extraction, grazing, wildlife, and recreation) by State and Federal entities under agreements with Reclamation. Recreation-based lands within Navajo State Park are managed by the Colorado Department of Parks and Recreation and the NMDPR.

A mixture of Federal, State, Tribal, and private land surrounds Navajo State Park. In New Mexico, Federal land adjacent to Navajo State Park is under the jurisdiction of BLM; State lands are managed by the NMDGF and New Mexico State Land Office (SLO). In Colorado, Southern Ute Indian lands are managed by the Tribe. Private lands bordering Navajo Reservoir in Arboles, Colorado, remain primarily agricultural with some areas of rural residential development.

Indian Reservations.—Navajo Nation lands comprise the largest Indian reservation holdings within the proposed project area (79 percent of the project area). Of Navajo Nation lands, approximately 3,730,555 acres occur in New Mexico and 140,891 within Arizona. Forty-three Navajo Nation chapters would be serviced by the proposed project (see the “Indian Trust Assets” section for additional discussion). The latest Navajo Reservation land Use Plan is dated March 2, 1961, and primarily inventories physical features, conditions, and resources at that time. An updated Land Use Plan is in progress, but not ready for public use.

Some Jicarilla Apache lands (approximately 33,954 acres, or less than 1 percent of total Jicarilla lands) within the southwest corner of the Jicarilla Apache Reservation are also included within the proposed project area. The Southern Ute Indian Reservation borders Reclamation lands on the Colorado side of Navajo Reservoir and the north end of the San Juan River in Colorado. The Ute Mountain Ute Tribe has a small portion of land within the San Juan River corridor within the Four Corners area in Colorado-New Mexico. The Pueblo of Zuni borders the Navajo Nation south of Gallup, New Mexico. The Southern Ute, Ute Mountain Ute, and Pueblo of Zuni Reservations are not serviced or affected by the proposed project.

BLM.—No project water is planned for delivery to Federal lands under the jurisdiction of BLM. Primary land use activities on BLM’s 680,014 acres include mineral extraction and livestock grazing. Roads and pipeline corridors constructed for natural gas development are common in this area.

Private and Other Lands.—Private lands in the proposed project service area include approximately 251,693 acres in New Mexico and 1,376 acres in Arizona. A majority of these lands are “in-holdings” within the Navajo Reservation. Private lands in the proposed project area fall under the jurisdiction of San Juan and McKinley Counties in New Mexico and Apache County in Arizona. The proposed project service area also includes the city of Gallup, New Mexico, which is approximately 7,200 acres.

Approximately 179,666 acres (4 percent) within the proposed project area are owned by the State of New Mexico. A majority of the lands are SLO lands, which are held in a federally created trust on behalf of 22 beneficiaries. Some of the beneficiaries include the common schools and New Mexico universities throughout the State. The SLO is legally mandated to charge fees for rights-of-way that cross SLO lands. Other Federal lands include 34,199 acres under the jurisdiction of the NPS (Chaco Culture National Historic Park), 164 acres under the jurisdiction of Reclamation, and 64 acres under the jurisdiction of the Department of Defense (less than 1 percent).

Land Use – Methodology

Contacts were made with various State, county, and local government agencies and the Navajo and Jicarilla Apache Nations to discuss land use impacts from implementation of the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Land Use – Impacts Analysis

No Action Alternative.—The No Action Alternative would have no effect on existing land uses in the Navajo Reservoir area. The No Action Alternative would, however, limit changes in land use to meet future needs on the Navajo Nation. The absence of dependable domestic water supplies and long distances to haul water for domestic use would limit the Navajo Nation’s abilities to meet future demands for housing and economic development. Land use planning for the city of Gallup would also be impacted by a decreasing domestic water supply as existing groundwater wells become exhausted.

The Jicarilla Apache Nation, on the other hand, has other viable options to deliver water to meet future water demands on the Jicarilla Apache Nation lands within the proposed project area. The No Action Alternative would have no effect on land use for other lands within the proposed project service area.

SJRPNM Alternative.—The SJRPNM Alternative would have no effect on existing land uses within the Navajo Reservoir area.

Under the SJRPNM Alternative, dependable domestic water supplies would be available to accommodate land use changes needed to meet Navajo and Jicarilla Apache Nation population growth projections. Foreseeable changes in land uses for the Navajo Nation include increased housing densities within the existing NTUA service areas.

GIS was used to calculate land ownership along the proposed SJRPNM pipeline alignment and existing NTUA distribution pipelines. With reliable water supplies, new housing, schools, and economic development are likely near existing NTUA distribution pipelines. As shown in table V-13, approximately 31 percent of Navajo Nation Trust and allotted lands and 28 percent of private lands occurring within the project service area are within 1 mile of the proposed SJRPNM and existing NTUA pipelines. Service-industry businesses (i.e., gas stations, grocery stores, lodging) would likely increase in these areas as well.

Jicarilla Apache Nation lands serviced by the proposed project would also experience some changes in land use. The SJRPNM Alternative includes a turn-out in the Cutter pipeline lateral capable of providing up to 1,200 acre-feet of water to the Jicarilla Apache Nation for future use and development. The dependable water supply provided by the proposed project would assist the Jicarilla Apache Nation in housing development for its members along U.S. Highway 44 and New Mexico State Road 573. The Jicarilla Apache Nation economic development plans for this area center on an existing casino and planned travel service center and accompanying business at and near the U.S. Highway 44/State Road 537 junction, where Jicarilla-refined fuel would be

Table V-13.—Land ownership within 1 mile and 500 feet of the SJRPNM Alternative pipeline route within the proposed project area

Land status	Total acres within proposed project area	Acres within 1 mile of SJRPNM Alternative and existing NTUA pipelines	Acres within 500 feet of SJRPNM Alternative pipelines
BLM	680,014	193,273	5,240
Navajo Nation (Tribal Trust and allotted lands)	3,871,446	1,201,273	20,787
Private lands (including the city of Gallup)	253,069	70,139	4,076
State of New Mexico	179,666	33,998	1,583
Jicarilla Apache Nation	33,954	1,293	0
NPS	34,199	672	0
U.S. Forest Service	7,488	0	0
Reclamation	164	0	0
Department of Defense (Fort Wingate)	64	16	0
Total	5,060,064	1,500,664	31,686

sold at retail and possibly wholesale. In addition, the Jicarilla Apache Tribal Utility Authority may ultimately develop a 100-megawatt, gas-fired commercial plant that could supply local power needs and also sell wholesale power on the open market.

The majority of the SJRPNM's pipeline route would follow existing transportation and utility corridors. A total of 31,686 acres would be temporarily disturbed during construction, as described in the "Vegetation Resources" section. Table V-13 describes land ownership within 500 feet of the proposed SJRPNM pipeline route.

Some grazing activities may be temporarily impacted during construction along the proposed project pipeline until vegetation is re-established.

Approximately 20 acres of private land adjacent to the San Juan River and 23 acres of Navajo Nation lands would be acquired and converted for project features, resulting in a change of land use. A trailer park (includes six residences to be relocated) and fallow agricultural land would be converted to pumping and water treatment facilities (i.e., siltation and evaporation ponds). The remaining acreage used for project features is primarily used for grazing activities. Future land uses within private lands serviced by the city of Gallup would also likely change as a result of the SJRPNM Alternative as additional domestic water became available.

NIIP Amarillo Alternative.—The NIIP Amarillo Alternative would have no effect on existing land uses within the Navajo Reservoir area.

Dependable domestic water supplies would be available to accommodate land use changes needed to meet Navajo and Jicarilla Apache Nation population growth projections as described for the SJRPNM Alternative.

New housing, schools, and economic developments are likely to occur near the pipelines as with the SJRPNM Alternative. Approximately 32 percent of Navajo Nation Trust and allotted lands and 28 percent of private lands occur within 1 mile of the proposed SJRPNM and existing NTUA pipelines (table V-14).

Table V-14.—Land ownership within 1 mile and 500 feet of the NIIP Amarillo Alternative pipeline route within the proposed project area

Land status	Total acres within proposed project area	Acres within 1 mile of NIIP Amarillo Alternative and existing NTUA pipelines	Acres within 500 feet of NIIP Amarillo Alternative pipelines
BLM	680,014	193,753	5,240
Navajo Nation (Tribal Trust and allotted lands)	3,871,446	1,222,674	20,565
Private lands (including the city of Gallup)	253,069	70,110	4,076
State of New Mexico	179,666	33,919	1,583
Jicarilla Apache Nation	33,954	1,293	0
NPS	34,199	672	0
U.S. Forest Service	7,488	0	0
Reclamation	164	0	0
Department of Defense (Fort Wingate)	64	16	0
Total	5,060,064	1,522,437	31,464

The majority of the NIIP Amarillo Alternative’s pipeline route would follow existing transportation and utility corridors. A total of 31,464 acres would be temporarily disturbed during construction (see the “Vegetation Resources” section and table V-14).

Approximately 249 acres of Navajo Nation lands would be permanently converted for project features and would result in a change of land use. Approximately 23 acres would be converted for pumping plants and storage tanks, and 226 acres would be converted to a storage reservoir.

Future land uses within private lands serviced by the city of Gallup would also likely change as a result of the NIIP Amarillo Alternative as additional domestic water became available.

Land Use – Mitigation Measures

Both action alternatives include proposed mitigation measures to reduce impacts to current land uses (primarily livestock grazing). Mitigation measures include revegetation of pipeline corridors concurrent with construction activities as described under the “Vegetation Resources” section of this chapter, fencing of revegetated areas to prevent grazing activities while disturbed areas become re-established, and offering relocation assistance to the six affected residences, located in the trailer park, displaced by construction of the San Juan River water treatment facility.

Land Use – Summary of Impacts

Changes in land use to meet future needs on the Navajo Nations lands would be limited under the No Action Alternative because of the absence of dependable domestic water supplies to meet future demands for housing and economic development. Land use planning for the city of Gallup would also be impacted by a decreasing domestic water supply as existing groundwater wells become exhausted.

Under the SJRPNM and NIIP Amarillo Alternatives, Navajo and Jicarilla Apache Nations’ lands and the city of Gallup would experience some changes in land use as areas are developed to meet future population demands. Changes in land use would occur through planning and zoning controlled by the Tribal Nations, the city of Gallup, and affected counties.

Under the SJRPNM Alternative, approximately 20 acres of private land adjacent to the San Juan River and 23 acres of Navajo Nation lands would be acquired and converted for project features and would result in a change of land use. With the NIIP Amarillo Alternative, approximately 249 acres of Navajo Nation lands would be permanently converted for project features, resulting in a change of land use. Approximately 23 acres would be converted for pumping plants and storage tanks, and 226 acres would be converted to a storage reservoir.

Hazardous Materials

This section address the potential impacts to hazardous material sites that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect hazardous material sites?

Overview

Scope

The hazardous material sites in this analysis include oil and gas pipelines crossing the San Juan River and other drainages, gas wells, and documented hazardous material sites. It does not include impacts on water quality or associated waste water discharge permits resulting from stream water quality standards for the San Juan River that were considered in the “Water Quality” section.

Impact Indicators

Impacts were considered adverse if implementation of alternatives disturbed hazardous material sites, resulting in a health risk to the public or the environment.

Hazardous Materials – Affected Environment

The hazardous materials of most concern are petroleum products that are transported in pipelines within the proposed project area, including the San Juan River and its tributaries. Crossings are predominately compressed natural gas (CNG) lines with a few liquefied petroleum gas (LPG) lines. If pipeline exposure/erosion occurred and the line was damaged, the CNG would be an airborne hazard, while the LPG would become a waterborne petroleum hazard.

Other areas of concern include oil and gas wells, primarily in northern and eastern portions of the proposed project service area. Over 7,772 active wells occur within the proposed project area, and new wells are continuing to be developed. The Shiprock Uranium Mill Tailings Remedial Action (UMTRA) Project site is also located southeast of Shiprock, New Mexico, on an elevated terrace about 50 feet above the San Juan River; however, the UMTRA site is outside the proposed pipeline routes.

Hazardous Materials – Methodology

GIS data were used to analyze potential hazardous sites within 500 feet of the SJRPNM and NIIP Amarillo Alternatives’ pipeline routes. Existing oil, gas, and other hazardous material pipeline locations were obtained from the Department of Transportations’ Office

of Pipeline Safety (OPS) (OPS, 2005). Well location data were obtained from the New Mexico Oil Conservation Division's "Allwells" database (Petroleum Recovery Research Center, 2005). In addition, Federal, State, Tribal, city, and county governments within the proposed project area were contacted to develop information on hazardous material sites. Information on the Shiprock UMTRA site was obtained from the Animas-La Plata Project Final Supplemental Environmental Impact Statement (Reclamation, 2000a).

Hazardous Materials – Impacts Analysis

No Action Alternative.—No impacts are projected under the No Action Alternative for pipeline crossings, gas wells, or other hazardous material sites.

SJRPNM Alternative.—Under the SJRPNM Alternative, the Cutter Lateral and PNM Lateral pipelines would cross an extensively developed natural gas field and transmission lines within the northern and eastern portions of the proposed project area. Based on geographic information data provided by the OPS and New Mexico Oil Conservation Division, the SJRPNM pipeline alignment would cross existing oil, gas, and other hazardous material pipelines 15 times, and 65 wells would be within 500 feet of the proposed pipeline routes (San Juan Lateral—7 wells, Cutter Lateral—57 wells, and Main Lateral—1). The proposed pipeline would parallel approximately 40 miles of existing natural gas transmission pipeline.

NIIP Amarillo Alternative.—Under the NIIP Amarillo Alternative, the Cutter Lateral and Amarillo Lateral pipelines would cross extensively developed natural gas fields and transmission lines within the northern and eastern portions of the proposed project area. Based on geographic information data provided by the OPS and New Mexico Oil Conservation Division, the NIIP Amarillo pipeline route would cross existing oil, gas, and other hazardous material pipeline 12 times, and 66 wells would be within 500 feet of the proposed pipeline routes (Amarillo Lateral—8 wells, Cutter Lateral—57 wells, and Main Lateral—1). The proposed pipeline would parallel approximately 40 miles of existing natural gas transmission pipeline.

Hazardous Materials – Mitigation Measures

Proposed mitigation measures include contacting pipeline and gas well companies prior to construction activities under both alternatives to identify and avoid existing hazards. The SJRPNM and NIIP Amarillo pipeline alignments could be adjusted as needed to avoid impacts to pipelines and wells.

Hazardous Materials – Summary of Impacts

The No Action Alternative would have no effect on hazardous material sites (oil and natural gas pipelines and wells). Both the SJRPNM and NIIP Amarillo Alternative pipeline alignments would cross existing oil, gas, and other hazardous material pipelines and existing gas wells and would parallel approximately 40 miles of existing natural gas transmission pipeline. Project pipeline alignments could be relocated to avoid impacts to hazardous materials.

Soils

This section address the potential impacts to soils that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect soils?

Overview

Scope

This scope includes soils and erosion characteristics within the construction footprints of the SJRPNM and NIIP Amarillo Alternatives.

Impact Indicators

The following impact indicators were applied because of the value of avoiding displacement or degradation of soil resources. Potential soil impacts were considered adverse if they would result in:

- (1) Soil stability hazards
- (2) Substantial soil losses due to wind and water erosion

Soils – Affected Environment

General Soil Classifications.—General soil classifications within the proposed project area are broken into 13 general classification types (figure V-9; New Mexico Resource Geographic Information System Program [NMRGISP], 2005). These generalized classifications are made by combining the delineations of detailed soil survey maps to form broader map units. These broader map units group similar map unit delineations and are commonly named for the two or three most dominant soil series or taxa. Detailed descriptions of the general soil classification types are included in attachment M.

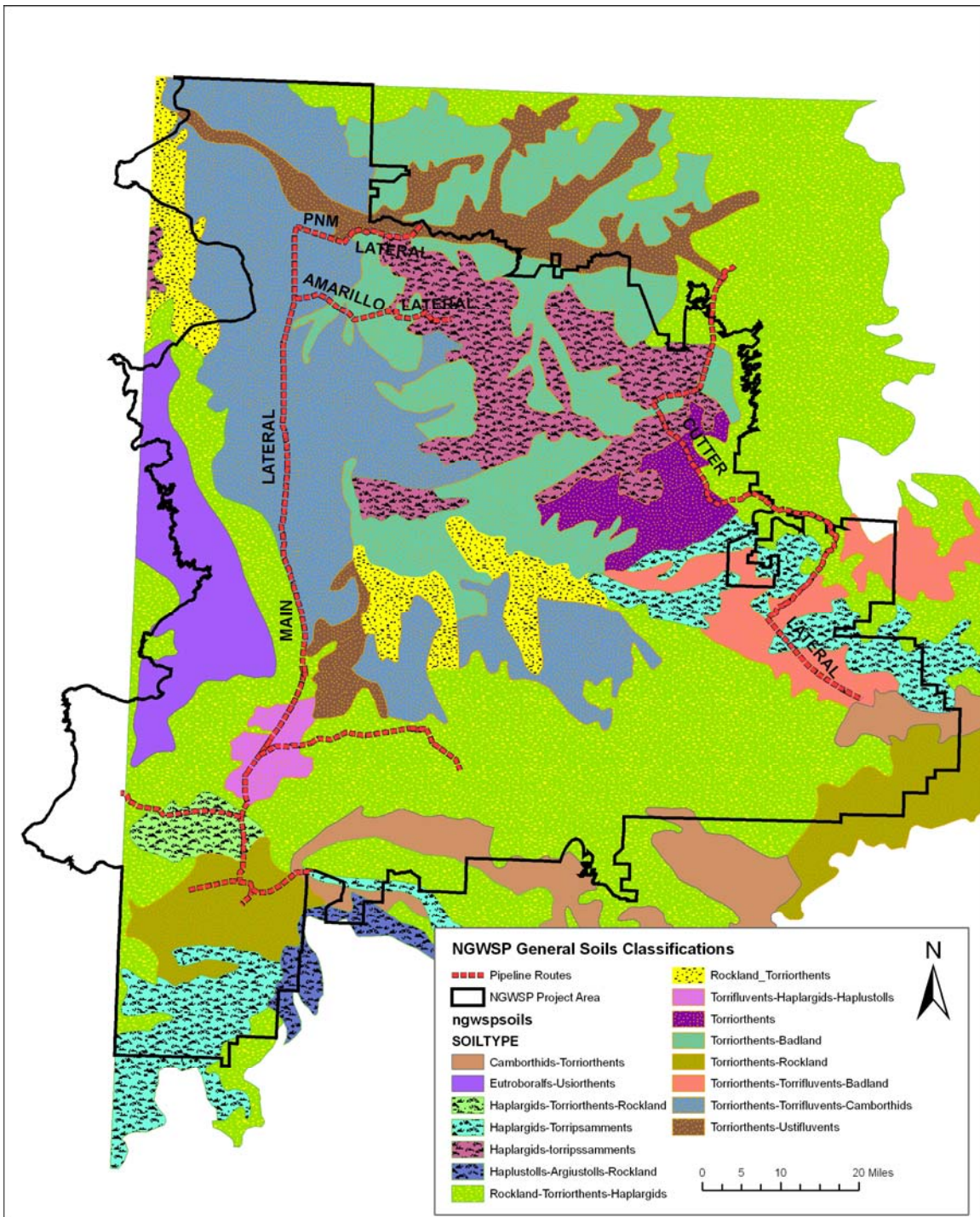


Figure V-9.—General soil classifications within the proposed project area.

Soils – Methodology

The Soil Survey Geographic (SSURGO) (Natural Resource Conservation Service, [NRCS], 2005) database for the Shiprock area; Parts of San Juan County, New Mexico; and Apache County, Arizona, SSURGO database for McKinley County area, New Mexico, and Soil Survey Tabular Database for San Juan County, New Mexico, Eastern Part available on the NRCS Soil Data Mart Web site were used to identify potentially affected soil resources. Applicable soil survey maps, unit descriptions, and supporting tabular information are summarized in attachment M, based on the extent of physical environmental impact that would result from the construction and operation of the proposed project. Land capability definitions are also included in attachment M. Impacts associated with pipeline excavation, backfill, and land conversion were quantitatively assessed from current project plans as overlain on soil survey map units.

Soils – Impacts Analysis

Soil resources are valuable because of the variety of land uses they support. Physical construction and operation of project structural components could generally disturb soil resources by either displacing them or degrading their ability to support land uses. Soil displacement occurs through either water- or wind-caused erosion. Eroded soils can subsequently lead to secondary water and/or air pollution. Large soil disturbances, such as mudslides or landslides, can also expose people to related physical hazards.

No Action Alternative.—During high (5,000 cfs) flow tests in 1998 and 2000, bank erosion concerns were identified in numerous places (at least 20 sites) from Navajo Dam to Kirtland, New Mexico.

Under the No Action Alternative, bank erosion is predicted to continue until the river stabilizes itself or property owners stabilize the banks using BMPs (berms, riprap, rock vanes, vegetation, and others). Long-term impacts from bank erosion would likely not be adverse due to stabilization of the banks.

In reaches of critical habitat for endangered fish species between Farmington and Lake Powell, soil erosion from the contributing drainage area would continue to add sediments to the San Juan River. Peak releases from Navajo Dam are anticipated to be sufficient to scour and transport this sediment down the river, in which case sediment of the river bottom would not occur and habitat conditions would be conducive to spawning and rearing of endangered fish.

SJRPNM Alternative.—Under the SJRPNM Alternative, soil erosion along the San Juan River would be similar to that described under the No Action Alternative because Navajo Reservoir would continue to be operated to meet the Flow Recommendations.

Additional soil erosion impacts would likely occur during SJRPNM pipeline construction. Using GIS to overlay SJRPNM pipeline routes and project features on existing NRCS soils data identified seven soil map units within the SJRPNM Alternative pipeline corridor that are either severe or very severe erosion hazards (attachment M). In addition, all soil types that occur within the SJRPNM Alternative pipeline corridor have severe limitations that make them generally unsuitable for cultivation and limit or restrict their uses to grazing, woodland, or wildlife.

Ground disturbance associated with construction of pipeline laterals and associated facilities would expose soils to potentially significant water and wind erosion from grading, excavation, alteration of surface hydrology, and vegetation removal. These disturbances could increase soil erosion through disturbed soils exposure. These impacts could be significant due to the large amount of total disturbance that would occur and the potential for secondary effects of water and air quality degradation from sediment and particulate matter releases.

The following association soil map units may be affected by the SJRPNM Alternative (attachment M): Aquima-Hawaikuh silt loams, Badland-Genats complex, Brimham-Benally-Genats association, Calladito-Elias association, Camac-Kimbrito-Badlands association, Counselor-Eslendo-Calladito complex, Farb-Chipeta-Rock outcrop complex, Jeddito-Escavada association, and Notal-Escavada-Riverwash. These soil types comprise about 4.9 percent (741 acres) of the 15,245 acres of soils classified within 100 feet of the proposed pipeline route and under Land Capability Subclass E. Land Capability Subclass E is made up of soils where excessive water is the dominant hazard or limitation in their use. Erosion susceptibility and past erosion damage are the major soil factors for placing soils in this subclass. All other soils occurring within the pipeline corridor are classified as Land Capability Subclass C or S. Subclass C is made up of soils where the climate (temperature or lack of moisture) is the only major hazard or limitation on their use, and Subclass S includes soils that have such limitations as shallowness of rooting zones, stones, low moisture-holding capacity, low fertility difficult to correct, and salinity and sodium.

NIIP Amarillo Alternative.—Under the NIIP Amarillo Alternative, no changes in soil erosion along the San Juan River are predicted because Navajo Reservoir would continue to be operated to meet the Flow Recommendations.

Additional soil erosion impacts would also likely occur during NIIP Amarillo pipeline construction. With exception of the Camac-Kimbrito-Badland association and

Notal-Escvada-Riverwash association soil map units, highly erodible soils identified in the SJRPNM Alternative occur within 100 feet of the NIIP Amarillo pipeline corridor (attachment M).

As is the case under the SJRPNM Alternative, all soil types that occur within the NIIP Amarillo Alternative pipeline corridor have severe limitations that make them generally unsuitable for cultivation and limit or restrict their uses to grazing, woodland, or wildlife.

Soils – Mitigation Measures

Impacts to soils can be mitigated by using responsible erosion control guidelines and BMPs to reduce erosion and sedimentation resulting from pipeline lateral and associated project feature construction activities. Proposed mitigation measures for both the SJRPNM and NIIP Amarillo Alternatives include the following activities for all soils affected:

- (1) Using water trucks to minimize wind erosion and dust during construction
- (2) Avoiding or minimizing disturbance of steep slopes whenever feasible
- (3) Constructing fill slopes to a 2 (horizontal) to 1 (vertical) ratio gradient or flatter
- (4) Constructing V-ditches above all cut and fill slopes to divert water from newly exposed slope faces
- (5) Revegetating existing slopes before the rainy season
- (6) Locating straw bale dikes or filter fabric barriers downslope of disturbed areas to act as sediment traps
- (7) Constructing temporary or permanent sedimentation basins as needed
- (8) Selectively removing, stockpiling, and replacing top soil as a surface medium for revegetation
- (9) Stabilizing drainage channels using rock lining or similar natural materials

Soils – Summary of Impacts

Soils map unit types with erosion susceptibility and past erosion damage would be affected by both action alternatives. Nine soils map unit types occur within 100 feet of the proposed SJRPNM Alternative's pipeline alignment, and seven soil map unit types

occur within 100 feet of the proposed NIIP Amarillo Alternative’s pipeline alignment. BMPs would be implemented under both alternatives, and impacts to soils would not be significant.

Geology

This section address the potential impacts to geology that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect geology?

Overview

Scope

This scope includes the San Juan River Valley and the Colorado Plateau within the project area.

Impact Indicators

The following indicators were used to evaluate the potential impacts to geologic resources. An impact would be considered adverse if one of the following were to occur as result of the proposed project:

- (1) Navajo Reservoir-induced seismicity resulting in dangerous conditions around the reservoir or damage to facilities
 - (2) An increase in erosion and sedimentation around the perimeter of Navajo Reservoir that affected operations of the dam or caused damage to equipment
 - (3) Catastrophic landslide damage to facilities around the reservoir or catastrophic endangerment to human life
 - (4) The potential to restrict recovery of mineral resources
-

Geology – Affected Environment

The scope includes portions of the San Juan, Little Colorado, and Rio Grande Basins, including the Colorado Plateau (figure V-10). Descriptions of the geologic map units within the proposed project are described in attachment M and summarized in table V-15 (Manley et al., 1987; NMRGISP, 2005).

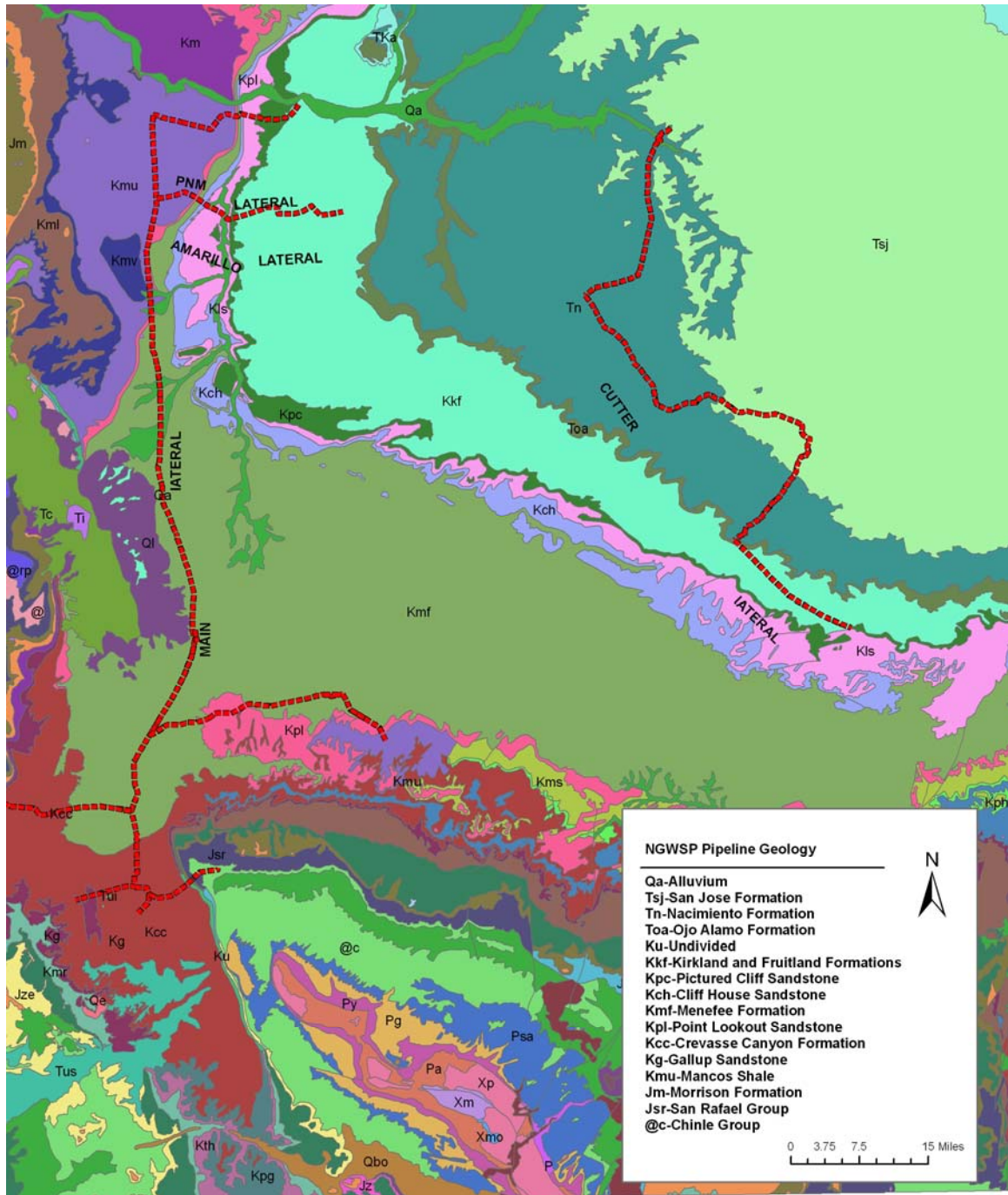


Figure V-10.—Geologic formations within the proposed project area.

Table V-15.—Geologic formations within the proposed project area

System	Series	Formation	Basin	Project feature
Quaternary	Holocene	Alluvium (Qa)	San Juan	Cutter Lateral Main Lateral Amarillo Lateral
Tertiary	Eocene	San Jose Formation (Tsj)	San Juan	Navajo Reservoir Cutter Lateral
	Paleocene	Nacimiento Formation (Tn)	San Juan	Cutter Lateral
		Ojo Alamo Formation (Toa)	San Juan	Cutter Lateral
Cretaceous	Upper Cretaceous	Undivided (Ku)	Little Colorado	Main Lateral
		Kirtland and Fruitland Formations (Kkf)	San Juan Rio Grande	Cutter Lateral Amarillo Lateral Main Lateral
		Pictured Cliff Sandstone (Kpc)	San Juan Rio Grande	Cutter Lateral Amarillo Lateral SJRPNM Lateral
		Cliff House Sandstone (Kch)	San Juan Rio Grande	Amarillo Lateral SJRPNM Lateral
		Menefee Formation (Kmf)	San Juan Rio Grande Little Colorado	Amarillo Lateral SJRPNM Lateral Main Lateral
		Point Lookout Sandstone (Kpl)	San Juan	Amarillo Lateral SJRPNM Lateral Main Lateral
		Crevasse Canyon Formation (Kcc)	Little Colorado	Main Lateral
		Gallup Sandstone (Kg)	Little Colorado	Main Lateral
		Mancos Shale, Upper Part (Kmu)	San Juan	Amarillo Lateral SJRPNM Lateral Main Lateral
Jurassic	Upper Jurassic	Morrison Formation (Jm)	Little Colorado	Main Lateral
	Middle Jurassic	San Rafael Group (Jsr)	Little Colorado	Main Lateral
Triassic	Upper Triassic	Chinle Group (c)	Little Colorado	Main Lateral

Note: Navajo Reservoir and Cutter and Main Laterals are common to both the SJRPNM and NIIP Amarillo Alternatives.

Geology – Impacts Analysis

No impacts are projected under the No Action, SJRPNM, and NIIP Amarillo Alternatives. Any geological resource impacts from the operation of Navajo Reservoir would fall within historic parameters. As a result, there would be no anticipated erosion, sedimentation, landslide activity, or potential restriction of mineral resource recovery. In addition, no active surface faults have been found within a relevant distance of the dam; therefore, reservoir-induced seismicity is not expected to be a problem.

For the action alternatives, no active surface faults have been found within a relevant distance of the structural components (intake and others); therefore, construction-induced seismicity is not expected to be a problem for the action alternatives.

Geology – Mitigation Measures

The proposed project is predicted to have no effect on geologic resources; therefore, no mitigation measures are proposed.

Paleontologic Resources

This section address the potential impacts to paleontologic resources that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect paleontologic resources?

Overview

Scope

The area of potential effects is defined as the proposed project alternative pipeline delivery routes and associated impact areas (project impact corridors) in the proposed project service area.

Impact Indicators

A significant environmental effect occurs when the proposed project will disrupt or adversely affect scientifically important fossil (paleontologic) resources. Adverse impacts to paleontologic resources could include destruction, disturbance, inundation, or vandalism to significant resources.

Paleontologic Resources – Affected Environment

Fossils are the remains, imprints, and traces of once-living organisms preserved in the Earth's crust. They may be bones and teeth, shells, leaf impressions, footprints, or burrows. Fossils are nonrenewable and (except for microfossils and those that make up the energy minerals) relatively rare resources with significant scientific, educational, commercial, and recreational values. Paleontology is the science that uses fossils to study life in past geologic times.

The Basin, which includes most of the proposed project, is an important area for paleontology. Some of the best-preserved botanical, mammalian, and reptilian fossils in North America are known to occur in the Triassic, Jurassic, Cretaceous, and Tertiary rock formations in the Basin. Dinosaurs and other fossils that have made significant contributions to the scientific record have been recovered, including a well-preserved Tyrannosaurus discovered in 1998. To preserve important paleontologic resources for scientific study and other public benefits, BLM has designated a number of areas for special management emphasis. Included in and around the proposed project area are the Bisti/De-Na-Zin Wilderness, the Carson Fossil Pocket, the Fossil Forest, the Kutz Canyon Fossil Area, and the Ah-Shi-Sle-Pah Wilderness Study Area. Immediately adjacent to or potentially impacted by the action alternatives are the Lybrook and Betonnie Tsosie Fossil Areas. The Betonnie Tsosie Fossil Area is a type location for early Paleocene North American land mammals (BLM, 2003).

Paleontologic Resources – Methodology

There is no overarching legislation protecting fossil resources. While neither Reclamation nor the Navajo Nation has an existing written policy for dealing with paleontologic resources on their lands or projects, early in its history, Reclamation recognized the importance of fossils. A 1905 circular produced by the agency included the following language:

In constructing irrigation works it is probable that fossiliferous beds will be uncovered, giving exceptionally good opportunities for collecting specimens of value to geologists and paleontologists. Well-preserved imprints of leaves, ferns, or other plant remains, fossil shells, and the bones and teeth of animals are always interesting, and may add much to our knowledge of the geologic history and structure of the region.

Paleontologic resources are protected under Federal property rules and regulations. Anyone wishing to collect fossils on Navajo Nation or Federal land must first obtain a permit. Permits are only issued for scientific research. They are given to people with specific qualifications that include related college education and experience.

Paleontologic Resources – Impacts Analysis

There may be significant impacts, short or long term, to paleontologic resources as a result of any of the SJRPNM and NIIP Amarillo Alternative plans for constructing the current project. The most probable area where impacts could occur is where the pipeline delivery route and associated impact areas cross through the Nageezi Chapter, which is common to both action alternatives. Here, the pipeline corridor skirts the Lybrook and Betonnie Tsosie Fossil Areas. Paleontologic resources could be exposed and impacted as a result of project implementation.

Paleontologic Resources – Mitigation Measures

Proposed mitigation measures for paleontologic resources follow three basic conditions:

Condition 1 (the majority of the area of potential effects): These are areas that contain no known vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils and are unlikely to yield any based on surface geology and/or soils. There are no mitigation requirements.

Condition 2: These are areas that contain no known vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils, but possess a high likelihood of occurrence because of exposed geological units or settings that indicate a high likelihood to yield them. These areas may have to be monitored during construction activities, and in the event of a discovery of paleontologic resources, the discovery will have to be evaluated for significance before construction can proceed at the point of discovery.

Condition 3: Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils (e.g., the Lybrook and Betonnie Tsosie Fossil Areas) would be managed on a case-by-case basis. It would require a paleontological clearance prior to any surface-disturbing activities and possibly include stipulations, constraints, and treatment measures that protect paleontologic values.

Paleontologic Resources – Summary of Impacts

Under the No Action Alternative, the proposed project would not be constructed and there would be no impacts to paleontologic resources. Existing management of paleontologic resources would be expected to continue in the project impact corridors.

Under both the SJRPNM and NIIP Amarillo Alternatives, there are probable impacts to paleontologic resources where construction activities would occur in fossil-bearing formations. Both alternatives' pipeline corridors skirt the Lybrook and Bettonie Tsosie Fossil Areas.

Air Quality and Noise

This section addresses the potential impacts to air quality and noise levels that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect air quality and noise levels?

Overview

Scope

This analysis centers on air quality and noise within the proposed project construction footprint.

Impact Indicators

An air quality impact would be considered adverse if one of the following were to occur as a result of the proposed project:

- (1) Short- or long-term violation of any national, State, or Tribal ambient air quality standards
- (2) Interference with any local air quality management planning efforts to attain or maintain air quality standards

The indicators used to determine noise impacts centered on whether the following effects would be caused by construction of the proposed project:

- (1) Noise generated that exceeded established ordinances or criteria
 - (2) Substantial increases in noise levels over existing noise levels in noise-sensitive areas
 - (3) Noise that would be disturbing or injurious to wildlife
-

Air Quality and Noise – Affected Environment

Air Quality.—The proposed project area lies within the Four Corners Interstate Air Quality Control Region with the closest ambient air monitoring sites located in Bloomfield and near Waterflow, New Mexico, in San Juan County.

Parameters measured at the site are nitrogen dioxide, sulfur dioxide, ozone, and meteorology. Major sources of air pollution in the area include the PNM San Juan Power Generating Station, the Arizona Public Services Four Corners Power Generating Station, and several oil and gas production facilities.

San Juan County is an attainment area for all air quality standards. Isolated exceedences have occurred in past years, and the mining of coal in the Basin between Farmington and Shiprock, New Mexico, causes occasional localized dust emissions. An emissions inventory in the county showed that the county leads the State of New Mexico in emissions from permitted stationary sources, primarily from oil and gas extraction and electric, gas, and sanitary services (New Mexico Air Quality Bureau, 1997). Two coal-fired powerplants are situated between Farmington and Shiprock.

Noise.—In general, the dominant sounds in the proposed project area originate from existing roadways, gas and oil production, and natural sources (water, wind, and wildlife). Localized traffic noise is generated within the proposed project area along New Mexico State Highway 511 and U.S. Highways 491 and 550.

Air Quality and Noise – Methodology

Impacts were evaluated by the following measures:

- (1) Local existing air quality material from various Federal and State agencies, Web sites, and publications was examined. A list was developed from the information obtained. The impacts included fugitive dust from vehicles or recreation exhaust and traffic patterns and any nearby industrial sources.
- (2) The expected impacts on local and regional air quality were evaluated against Federal and local requirements for protecting public health (table V-16).

Air Quality and Noise – Impacts Analysis

No Action Alternative.—Under the No Action Alternative, air quality may slightly increase when compared to historic levels because of more soil to wind erosion (Reclamation, 2006). Oil and gas exploration is expected to continue within the proposed

Table V-16.—Air quality criteria pollutants and regulatory limits

Pollutant	Period	National ¹	New Mexico ²
Particulate matter 10 (PM ₁₀)	24-hour average	150 µg/m ³	150 µg/m ³
	Annual	50 µg/m ³	60 µg/m ³
Particulate matter 2.5 (PM _{2.5})	24-hour average	65 µg/m ³	—
	Annual	15 µg/m ³	—
Sulfur dioxide	3-hour average	0.5 ppm	—
	24-hour average	0.14 ppm	0.10 ppm
	Annual	0.03 ppm	0.02 ppm
Carbon monoxide	1-hour average	35 ppm	13.1 ppm
	8-hour average	9 ppm	8.7 ppm
Nitrogen dioxide	Annual	0.053 ppm	0.05 ppm
Ozone	1-hour average	0.12 ppm	—
	Annual	0.08 ppm	—
Lead	Annual	1.5 µg/m ³	

¹ Source: 40 Code of Federal Regulations sections 50.4 through 50.12 (1999).

² Source: New Mexico Ambient Air Quality Standards 20 NMAC 2.03 (1996).

³ The new PM_{2.5} (particulate matter) standards have not been implemented.

project area, and vehicles driving to service pads and wells will continue to cause small, localized fugitive dust. Recreational use will continue and possibly increase over time, with some intermittent periods of increases in fugitive dust associated with the construction of new recreation facilities. Overall, no adverse impact on air quality is predicted.

SJRPNM Alternative.—Fugitive dust would be emitted during excavation and related earthwork during construction of the action alternative pipelines, pumping plants, and associated facilities. Fugitive dust emissions (of which PM₁₀ is a component) would occur during ground-disturbing construction activities.

The construction schedule presented in attachment J shows construction of the proposed project in phases. Under normal weather conditions, the dust and other emissions caused by the proposed project would be localized in the immediate areas of construction. However, under infrequent conditions of high winds, the dust could become additive for brief periods. Sources of emission from the SJRPNM Alternative would be from the construction of (1) the PNM diversion structure, pumping plant, and water treatment facility; (2) Cutter Reservoir pumping plant and water treatment facility; (3) PNM

Lateral; (4) Cutter Lateral and associated facilities; and (5) the Main Lateral and associated facilities. Most of these emissions are from equipment travel over unpaved roads or direct disturbance of the soil by excavation, transport, grading, and compacting. Application of standard dust suppression techniques (e.g., soil stabilization or watering of trench stockpiles) would reduce daily PM₁₀ emissions. Impacts to air quality under the SJRPNM Alternative would be minor and are not considered significant.

NIIP Amarillo Alternative.—Impacts under the NIIP Amarillo Alternative would be similar to those describe under the SJPNM Alternative except that sources of emission would be from construction of (1) Cutter Reservoir pumping plant and water treatment facility, (2) Amarillo Lateral and associated reservoirs and facilities, (3) Cutter Lateral and associated facilities, and (4) the Main Lateral and associated facilities. Impacts to air quality under the NIIP Amarillo Alternative would be minor and are not considered significant.

Air Quality and Noise – Mitigation Measures

Proposed mitigation measures for air quality include water spraying of haul roads, work areas, and storage piles that are prone to wind-blown dust; operating practices that minimize the area of exposed soil subject to producing dust; and revegetation of disturbed areas. No mitigation measures are proposed for noise.

Air Quality and Noise – Summary of Impacts

The No Action, SJRPNM, and NIIP Amarillo Alternatives would not result in any significant adverse impacts, short or long term, to air quality or noise levels.

Socioeconomics

This section addresses the potential impacts to social conditions and economic sectors that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect local social conditions and economies?

Overview

Scope

This section addresses the potential impacts to social conditions and economic sectors that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives. This section focuses on the issue of how these alternative scenarios could affect local socioeconomic attributes and considers impacts on three groups of people—the Navajo Nation, the Jicarilla Apache Nation, and the broader northwest New Mexico area composed of McKinley and San Juan Counties. The types of socioeconomic impacts addressed include (1) accessibility to water, (2) public health, (3) employment impacts, and (4) demand for local services.

Impact Indicators

The following indicators are used to assess the socioeconomic impacts of alternative project scenarios:

- (1) Access to adequate, piped water supply
- (2) Access to clean water supply
- (3) Regional economic output
- (4) Regional personal income
- (5) Regional employment
- (6) Increase in demand for local service relative to normal year-to-year fluctuation

Socioeconomics – Affected Environment

Access to Adequate, Piped Water Supply.—

Navajo Nation – More than 40 percent of the Navajo people living in the proposed project service area presently have no access to piped water and, consequently, haul water from sometimes distant sources. Some of the water they do consume is from nonpotable sources intended for stock watering and is not in compliance with EPA water quality standards.

City of Gallup – The city of Gallup currently relies on groundwater pumping to supply water to its residents. The water level in the city’s wells has been falling by 7 to 29 feet per year over an extended period, and at some point, the production capacity of the current well system is expected to diminish. The quality of this groundwater exceeds the national secondary water quality standard for TDS and sulfate, causing increased corrosion and rapid degradation of plumbing and appliances.

Regional Economics.—The San Juan-McKinley County area has experienced long-term unemployment problems, particularly in the Navajo and Jicarilla Apache Nation. In recent years, the overall unemployment rate in the area has exceeded the national rate by approximately 10 percent to 70 percent, while the unemployment rate among Navajo and Jicarilla Apache Nations’ people has been six to ten times the national rate. To the extent that the construction and operation jobs could be filled by currently unemployed local people, the proposed project could represent an important benefit to the local area’s socioeconomic condition. The Water Resources Council’s *Principles and Guidelines* conclude that in an area of substantial and persistent unemployment, a local hire rule can increase the percent of jobs going to otherwise unemployed people from 30 percent to 43 percent (in the case of skilled workers) and from 47 percent to 58 percent (in the case of unskilled workers).

Socioeconomics – Methodology

Existing population, water accessibility, employment, and income information was compared with the anticipated impacts of construction and project operation. An economic impact assessment model, IMPLAN, was used to estimate the impacts of economic changes in the area. The detailed analysis can be found in volume II, appendix D, part IV.

Socioeconomics – Impacts Analysis

No Action Alternative.—

Access to Adequate, Piped Water Supply – The No Action Alternative would not improve access to water for the Navajos. It is estimated that the available water per capita for the city of Gallup would fall to less than one-half of existing water use by the year 2033. The Jicarilla Apache Nation has an alternative means potentially available to deliver water to the proposed project service area.

Access to Clean Water – A primary rationale for the public policy of providing clean and reliable water to all people in the United States is the resulting health benefit. Lack of a clean water supply would continue to be a problem on the Navajo Reservation under the No Action Alternative. The city of Gallup and the Jicarilla Apache Nation would have access to clean water.

Regional Economic Output – The No Action Alternative would not result in any regional economic stimulus.

Regional Personal Income – The No Action Alternative would not result in any regional earnings stimulus.

Regional Employment – The No Action Alternative would not provide any construction phase or long-term employment.

Increase in Demand for Local Services – The No Action Alternative would not affect the demand for local services.

SJRPNM Alternative.—

Access to Adequate, Piped Water Supply –The SJRPNM Alternative would provide a reliable supply of treated water to Navajo Nation areas that are presently without a piped water supply. The SJRPNM Alternative would provide the city of Gallup with water needed to replace the diminishing groundwater supply. The Jicarilla Apache Nation has an alternative means potentially available to deliver water to the proposed project service area, so this would provide another alternative.

Access to Clean Water – The SJRPNM Alternative would provide a safe water supply to many households who would otherwise not have it, particularly on the Navajo Reservation. The city of Gallup and the Jicarilla Apache Nation would have access to clean water under any alternative.

Regional Economic Output – The proposed project would stimulate the local economy for both the construction and operation phases. The construction phase is expected to last about 13 years, and construction would occur primarily in San Juan and McKinley Counties. In addition to the direct spending on the proposed project, regional economic output to support the proposed project and purchases by project workers should amount to about \$688,000 for every \$1 million spent on the proposed project. Over the entire construction period, this should total about \$492 million for the SJRPNM Alternative (January 2005 dollars).

Regional Personal Income – The proposed project would generate earnings not only for construction workers but also for employees in the businesses supporting the proposed project and those providing goods and services to other workers. Total earnings generated should amount to about \$644,000 for every \$1 million in project construction costs. Over the entire construction period, this should total about \$460 million for the SJRPNM Alternative (January 2005 dollars).

Regional Employment – The proposed project would not only employ workers for construction and operation, but it would result in additional employment in the businesses providing goods and services to the project and to its workers. Under the SJRPNM Alternative, construction employment could average about 600 workers and peak at about 650 workers during the 3rd through 12th years of construction. These employment numbers could increase to 1,240 when employees are counted in businesses providing goods and services to the proposed project and to its workers. The operational phase

would employ about 22 full-time equivalent workers on a long-term basis. The proposed project could result in a significant number of jobs for otherwise unemployed people—in the range of an estimated 30 to 58 percent.

Increase in Demand for Local Services – Although many project workers may be hired from the local population base, some other workers may be attracted from outside the area. If the number of immigrants is sufficiently large, it may have negative effects on both the community infrastructure and on the community social fabric. As indicated in the previous section, the SJRPNM Alternative would add about 1,240 total employees to the McKinley/San Juan County area. The significance of these increases is a remaining question. Regional employment has varied considerably from year to year.

The project-related total employment change is estimated to be well within the magnitude of annual variation in regional employment, represented by one standard deviation, and therefore would not be expected to result in any unusual stress on local services or infrastructure.

Project operation would require operations and maintenance personnel, and local businesses would hire additional employees to provide goods and services for the proposed project and its employees. A total of about 66 workers would be needed for either project alternative. Of the total, about one-third would work directly on the proposed project, another third would work for businesses that supply goods and services to the proposed project, and the remaining third would work for businesses that provide goods and services to project employees and employees of the businesses supplying the proposed project. Sixty-six employees represent about one-tenth of 1 percent of total area employment. This level of employment should not have more than a minor impact on the area's infrastructure and services.

NIIP Amarillo Alternative.—Impacts for the NIIP Amarillo Alternative are the same as under the SJRPNM Alternative except for a minor difference in construction regional economic employment. Under the NIIP Amarillo Alternative, construction employment should average about 640 workers and peak at about 690 workers during the 3rd through 12th years of construction. These employment numbers would increase to 1,320 when employees are counted in businesses providing goods and services for the proposed project and its workers.

Socioeconomics – Mitigation Measures

No mitigation measures are proposed for socioeconomic resources.

Socioeconomics – Summary of Impacts

The SJPNM and NIIP Amarillo Alternatives should have strong positive effects on accessibility to water, public health, and employment. If project jobs were filled predominantly by new arrivals to the area, there may be a minor negative impact on demand for local services. Although there could be positive effects on employment, total project employment would not represent a fluctuation beyond extremes in the area's year-to-year total employment.

Environmental Justice

This section addresses the potential impacts to Environmental Justice that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect environmental justice?

Overview

Scope

The area of potential effects is defined as the proposed project construction and service areas.

Impact Indicators

The indicators applicable to the environmental justice parameter are whether the proposed project would create disproportionately adverse effects to minority or low-income populations.

Environmental Justice – Introduction

The environmental justice parameter is essentially one of assessing or analyzing discrimination against specific subpopulations. Executive Order 12898 directs that Federal programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations (*Federal Register*, 1994).

Environmental Justice – Affected Environment

Substantial populations in the proposed project area clearly qualify as minority and/or low income. The 2000 Census of Population reports that 74.7 percent of the 74,798 people in McKinley County and 36.9 percent of the 113,801 people in San Juan County are American Indians. The 2000 census also shows median household income for both the Navajo people (\$21,830) and Jicarilla Apache people (\$26,667) in New Mexico is below the New Mexico State average (\$34,133).

Environmental Justice – Methodology

Census data for race and ethnicity, poverty levels, and median household income (1999 dollars) were analyzed.

Environmental Justice – Impacts Analysis

No major adverse impacts from either project alternative have been identified, and, accordingly, there is no indication that any adverse impacts would have a disproportionate effect on the minority and low-income populations.

Conversely, the beneficial effects of providing water to those who would otherwise have to haul water would accrue primarily to the minority and low-income populations. This access-to-water benefit and related health improvements are discussed in earlier sections of this report. These important positive project impacts would assist rather than harm minority and low-income populations.

Environmental Justice – Mitigation Measures

No mitigation measures are proposed for environmental justice.

Environmental Justice – Summary of Impacts

The action alternatives would assist minority and low-income populations.

Cultural Resources

This section addresses the potential impacts to cultural resources that could result from actions associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Issue: How would the No Action, SJRPNM, and NIIP Amarillo Alternatives affect cultural resources?

Overview

Scope

The area of potential effects is defined as the proposed project alternative pipeline delivery routes and associated impact areas (project impact corridors) in the proposed project service area.

Impact Indicators

For cultural resources, a significant environmental effect would occur when the proposed project disrupted or adversely affected historic properties. Adverse impacts to cultural resources could include destruction, disturbance, inundation, or vandalism to significant resources. Other adverse impacts could include disturbance to graves and cultural items and destruction of, or preventing access to, sacred sites or in-use areas.

Cultural Resources – Introduction

Cultural resources are physical or other expressions of past human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites and isolated artifacts or features, historic structures, human burials, sacred sites, and areas of important cultural value to existing communities (traditional cultural properties [TCPs]). Cultural resources that are eligible for inclusion in the *National Register of Historic Places (National Register)* are protected under the National Historic Preservation Act (NHPA) of 1966, as amended in 1992, are hereby referred to as historic properties. Cultural resources may also be protected under the NAGPRA;²³ the American Indian Religious Freedom Act; Executive Order 13007, Protection of Native American Sacred Sites; and other State, agency, or Tribal laws and policies.

Cultural Resources – Affected Environment

The proposed alternatives lie in the San Juan, Rio Grande, and Little Colorado River Basins, an area well known for its archaeology and contemporary/historical Native

²³ Native American Graves Protection and Repatriation Act: A Federal law, passed in 1990, that provides a process for museums and Federal agencies to return such Native American cultural items as human remains, funerary objects, sacred objects, and objects of cultural patrimony to lineal descendants, culturally affiliated Indian Tribes, and Native Hawaiian organizations.

American culture. More than 10,000 years of human existence are represented in the area. Prominent cultural/archaeological features in or around the proposed project area include the Navajo Reservoir Archaeological District, Salmon Ruins, Canyon de Chelly National Monument, and the Navajo and Jicarilla Apache Indian Reservation lands. Chaco Culture National Historic Park lies in the approximate center of the proposed project area.

The mobile hunter-gatherer PaleoIndian and Archaic (9500 B.C. to A.D. 1) groups were followed by the pre-Puebloan and Ancient Puebloan (Anasazi) (A.D. 200–1300) occupations, which represent the highest frequency of cultural resources in the proposed project area. By A.D. 500, the Basketmaker culture was firmly established, with increased agricultural production and less dependence on hunting. The subsequent development and expansion of the Ancient Puebloan culture is best represented at Chaco Culture National Historic Park, which had become the major population center prior to its decline in the 12th century. These sedentary farmers and villagers had developed a system of roads that connected population centers to outlying communities. This system then became fragmented and the area had completely depopulated by A.D. 1250. This is followed by the Athabascan (Navajo and Jicarilla Apache) Settlement Period (A.D. 1400–1870) and EuroAmerican settlement (1870–Present).

Historic Inhabitants.—

PaleoIndian – The earliest known human presence is that of the PaleoIndians who inhabited the area as early as 9500 B.C. Their presence across the landscape was presumably small and disperse, and evidence of their occupation is nebulous.

Archaic – The Archaic period in the region is typified by a change from a big-game hunting emphasis to the hunting of smaller, modern game and the intensive collection of plant foods. Most sites of this period date between 8000 and 2000 BP (Before Present).

Pre-Puebloan and Puebloan – The (pre-Puebloan) Basketmaker culture was named for its finely woven baskets and lack of pottery. The Basketmaker II period is characterized by the adoption of structures and features for habitation and storage of surplus foods. Basketmaker II sites appear to date between A.D. 200 and 400. The Basketmaker III period (A.D. 400–700) marks the beginning of a more sedentary agricultural lifestyle and the use of ceramics and adoption of the bow and arrow. This period also represents the beginnings of the typical Anasazi (Ancient Pueblo) site layout.

The Pueblo I period (A.D. 700–900) is well represented with small hamlets scattered across the proposed project area. It is during this period that surface structures, identified as pueblos, become increasingly common.

The Pueblo II and Pueblo III periods (A.D. 900–1300) are characterized by larger pueblos, which usually include masonry roomblocks and larger semicircular pit structures (kivas). They are the ruins familiar to most modern visitors to the area, such as the sites on display at Chaco Canyon National Historic Park. The Pueblo II and Pueblo III periods are well represented in the proposed project area.

Athabascan – Two Native American protohistoric/historic traditions are found in the region—the Navajo and the Jicarilla Apache. The earliest evidence for the Athabascan occupation may date as early as the 1400s.

Modern-Day.—The majority of the proposed project impact corridors occur within the boundaries of the Navajo Nation. In accordance with Navajo Nation policies, contemporary or recently abandoned residences and features or areas (in-use areas) are considered historic sites. Additionally, a number of contemporary Native American Tribal Nations have ancestral and traditional ties to the proposed project area. Archaeological data provide some information about prehistoric and historic aboriginal use of the region; however, each Tribe or community has its own account of the traditional use of the area. There is a high likelihood of encountering in-use areas, TCPs, sacred items, and human remains during project planning, archaeological excavation, or construction activities.

Ethnographic.—Consultation has been initiated to identify the potential for TCPs that may be affected by the proposed project. This is intended to assist compliance with the NHPA, using guidelines in *National Register Bulletin 38* (Parker and King, 1990) and *National Register Bulletin 15* (NPS, 1991). It was also done in accordance with Bureau of Reclamation Guidance for Implementing Indian Sacred Sites Executive Order 13007 and to solicit Tribal Nation and chapter input on the treatment of human remains and cultural items covered under NAGPRA. A total of 21 Tribal Nations and 23 Navajo Nation chapters were contacted regarding their concerns about potential impacts of the proposed project on TCPs, sacred sites, and burials that may be in or adjacent to the proposed project area.

TCPs and Human Remains.—TCPs are sites or areas of important cultural value to existing communities. They may not have actual physical remnants associated with their existence. Research indicates that approximately 21 Tribes/Tribal Nations have ancestral and contemporary ties to the proposed project area. Archaeological data provide some information about prehistoric and historic aboriginal use of the region; however, each Tribe/Nation has its own account of its traditional use of the area.

While direct evidence for the existence of burial sites in the proposed project area is lacking, knowledge of the cultural resources indicates a high likelihood of encountering

human remains during archaeological excavation or construction activities. Burials on Puebloan archaeological sites are rather common and are to be expected. On past projects, a number of the consulted Tribes/Nations expressed concerns about the human remains and cultural items that may be affected. Intact Basketmaker and Puebloan habitation sites were of particular concern to a number of Tribes/Nations and are considered TCPs. These sites are extant across all features and elements of the proposed project. Tribes/Nations may request to visit the proposed project area to determine if ground disturbance will impact TCPs, traditional use areas, or sacred sites as fieldwork is ongoing. Further identification and treatment efforts will be in consultation with these and other consulting Tribes/Tribal Nations as appropriate.

In dealing with the discovery and disposition of human remains, the regulations in NAGPRA must be followed on Federal projects. NAGPRA requires consultation with Indian Tribes and a permit under the Archaeological Resources Protection Act before human remains and associated funerary objects are exhumed from Federal lands and Indian Trust Lands (State permits are required for State and private lands). Chapter VII provides additional information on the current status of Tribal and chapter consultation.

Cultural Resources – Methodology

Methodology.—The methods used to determine the presence of cultural resource sites located within the proposed project area consisted of a literature review, limited archaeological field surveys, and supplemental ethnographic evaluation. These studies were conducted to provide additional information for areas that had not undergone previous examination and to verify previous results.

Significance Criteria.—Criteria were developed and used to determine the significance of impacts to cultural resources resulting directly or indirectly from the action alternatives. For cultural resources, a significant environmental effect occurs when the proposed project would disrupt or adversely affect a prehistoric or historic archaeological site or a property of historic interest or cultural significance to a community or ethnic or social group. Adverse impacts to cultural resources could include destruction, disturbance, alteration, inundation, or vandalism; these impacts are considered significant if they would occur to cultural resource sites that are eligible, or listed for inclusion in, the *National Register* or protected under other Federal or Tribal laws and policies. Other adverse impacts would include disturbance to graves and cultural items protected under NAGPRA and destruction of, or preventing access to, sacred sites protected under Executive Order 13007.

It should be noted that while significant impacts to cultural resources may be “resolved” through treatment measures of encountered resources such as data recovery (excavation)

in compliance with applicable regulations and guidelines, such resolution would not reduce impacts to less-than-significant levels. As such, significant impacts, which may be resolved, would remain significant and unavoidable.

Cultural Resource Tasks.—Cultural resource tasks included cultural resource surveys, ethnographic investigations, identification and evaluation of in-use areas, and consultations with Navajo Nation chapters and State, Tribal, and Federal entities. Additional work on these tasks would be necessary if the proposed project were implemented.

Tribal and Navajo Nation Chapter Contact.—A letter describing the proposed project and a request for input on traditional cultural use and/or history of the area was sent to the consulting Tribal/Nation governments and Navajo Nation chapters. Responses were received from the Navajo Nation, Pueblo of Zuni, Laguna Pueblo, Hopi Tribe, and Isleta Pueblo. Followup telephone calls and meetings were also held to identify further work with a specific Tribe, Nation, or chapter. Tribes requested to be kept informed as more information on cultural resources becomes available. In addition, Reclamation has held several meetings with the Navajo Nation Historic Preservation Office to discuss and review potential project alignments.

Cultural Resources – Impacts Analysis

Based on the significance criteria described under “Cultural Resources Methodology,” there would be significant impacts, short or long term, to cultural resources as a result of any of the alternative plans for constructing the proposed project. Archaeological, historical, and traditional cultural resources would be exposed and impacted as a result project implementation. Generally, the NIIP Amarillo Alternative is more impacting to cultural resources than the SJRPNM Alternative at a 1.75:1 ratio.

Various studies have been conducted (Pfaff, 1993; Mabry, 2001; Wharton and Cleveland, 2002) to evaluate the relative impacts (and associated mitigation costs) to cultural resources of the proposed action. Most recently, the Navajo Nation Archaeology Department conducted background research and a sample inventory of selected areas from the various alternatives being considered. The study concluded that all of the action alternatives would result in a significant environmental effect to cultural resources to varying degrees.

No Action Alternative.—Under the No Action Alternative, current trends that have an impact to cultural resources would continue. The Colorado Plateau (of which the proposed project area is a part) was listed in 1995 by the National Trust as one of the

11 most endangered historic treasures in the United States. Archaeological and historic sites that are important to the Native American heritage of the region are particularly threatened. Trends of looting and development would continue without the proposed project. There is no mitigation required under the No Action Alternative. Without the proposed project, existing (Navajo Nation, State, Federal, and city of Gallup) resource management policies are employed to ensure the protection of cultural resources.

SJRPNM Alternative.—

Archaeological and Historical—Under the SJRPNM Alternative, it is estimated that 104 cultural resource sites would be within the area of potential effects. Ground disturbance and other activities associated with construction and operation of the proposed project would disturb and/or destroy cultural resources located in these areas. Due to the known significance of the area, the impacts to an estimated 80–90 sites for the SJRPNM Alternative are considered significant. The potentially affected sites include Archaic period sites, Anasazi (Ancient Pueblo) habitation and limited-use sites, historic Native American (Athabaskan) sites, and other Historic (EuroAmerican) properties. Specific effects would be identified upon complete inventory of these actions. Ground disturbance and other related activities would create the potential for disturbing or destroying cultural resources. Roads in rights-of-way corridors along pipelines would also afford greater public access to previously undisturbed areas. Damage to sites could occur in the form of off-road vehicle use on cultural resources sites, vandalism, or erosion from tertiary roads or trails.

NIIP Amarillo Alternative.—

Archaeological and Historical.—Cultural resource impacts are similar to those described under the SJRPNM Alternative, except that more sites could be affected under the NIIP Amarillo Alternative. It is estimated that 183 cultural sites would be within the NIIP Amarillo Alternative area of potential effects. Ground disturbance and other activities associated with construction and operation of the proposed project would disturb and/or destroy an estimated 145 sites under the NIIP Amarillo Alternative, which is considered significant.

Cultural Resources – Mitigation Measures

It is anticipated that approximately 145 cultural resource sites under the NIIP Amarillo Alternative and approximately 80–90 cultural resource sites under the SJRPNM Alternative would require some level of mitigative treatment, including archaeological

testing or full data recovery (archaeological excavation).²⁴ Proposed mitigation measures include avoiding sites where possible or a program to compensate for losses of archaeological sites that would occur as a result of construction and operation of the proposed project and the construction of conveyances. The program would be undertaken by Reclamation in coordination with the New Mexico State Historic Preservation Officer (NMSHPO), the Navajo Nation Tribal Historic Preservation Officer (NNTHPO), Hopi Tribe Cultural Preservation Office (HTCPO), BLM, BIA, the city of Gallup, and the Advisory Council on Historic Preservation. The proposed program would consist of recovery, analysis, technical publication, and providing for storage and curation for permanent maintenance of the artifact collection and other related information. In addition to the scientific value, this would produce information of considerable public interest. A programmatic agreement similar to the one executed for the ALP Project would be developed and signed by all parties prior to implementation of the proposed project.

Implementation of the historic/archaeological treatment measures and publication of results would be completed pursuant to a programmatic agreement. Proposed measures to minimize and avoid impacts to cultural resources, such as in-place preservation, monitoring, distribution of information, and public and Tribal/Tribal Nation involvement, would be implemented. If cultural resource sites cannot be avoided and protected in place, a program to compensate for losses to sites as a result of project implementation would be needed. This program would include archaeological excavations and publications and reports detailing the findings of those excavations. Educational programs and public access to the excavations would be part of the mitigation plan.

Historic American Building Survey/Historic American Engineering Record recordation, written and/or oral histories, site stabilization, and/or ethnographic studies would also be implemented, as appropriate. In addition to the archaeological interpretation of the site data, consulting Tribes/Tribal Nations would be given the opportunity to provide input to the treatment of sites of cultural importance and to form their own interpretation of these data, in the form of continued consultation between Reclamation and the consulting Tribes/Tribal Nations. Tribal consultation is also recommended regarding data collection at certain traditional cultural resources sites (collection areas, ceremonial sites, trails, etc.) when avoidance is not possible.

Mitigation of impacts to cultural resource sites could be accomplished through archaeological excavation and the study and publication of the results. Through consultation with the Advisory Council on Historic Preservation, interested Tribes/Tribal Nations, NMSHPO, NNTHPO, HTCPO, and involved agencies, a research design and work plan would be produced that, along with the programmatic agreement, would guide the mitigation efforts.

²⁴ The term “treatment,” rather than mitigation, is the preferred term because excavation may not be appropriate in regard to some cultural resources (i.e., ceremonial sites).

Activities described could disturb or expose Native American human remains and cultural items protected under NAGPRA or prevent access to sacred sites protected under Executive Order 13007. Mitigation measures would be followed in accordance with NAGPRA and Executive Order 13007. The preferred mitigation would be the avoidance and in-place preservation of graves and sacred sites to the degree possible. When this was unavoidable, Reclamation would consult with affected Tribes/Tribal Nations to determine the most appropriate action. Since no sacred sites have yet been identified that would be impacted by the alternative, no specific mitigation measures are described. However, since it is likely that human remains will be encountered, a NAGPRA Plan, in consultation with the potentially affected Tribes/Tribal Nations, would be developed.

The NAGPRA Plan would describe the procedures that are to be followed in the event that human remains or cultural items are encountered during the course of project activities.

Cultural Resources – Summary of Impacts

Under the No Action Alternative, the proposed project would not be constructed, and there would be no impacts to cultural resources attributable to the project. Existing management of cultural resources would be expected to continue in the project impact corridors.

Under the SJRPNM Alternative, it is estimated that 104 cultural resource sites would be within the area of potential effects (with 80–90 sites impacted). For the NIIP Amarillo Alternative, it is estimated that 183 cultural resource sites would be within the area of potential effects (with 145 sites impacted).

Biodiversity and Sustainability

Biological diversity, or “biodiversity,” has become a significant focus of land management agencies throughout the Western United States. The loss of biological diversity is currently recognized as an important issue that may have ecological and economic consequences. Biodiversity focuses on native species or communities that are rare or under-represented, emphasizing the genetic, structural, compositional, and functional components of diversity. While the wide-ranging vegetation types within the proposed project area support many levels and scales of biological diversity, this section focuses on species and communities that are considered sensitive to disturbance.

Biodiversity is defined as the variety of life and its processes and the interrelationships within and among various levels of ecological organization. Conservation, protection, and restoration of biological species and genetic diversity are needed to sustain the health

of existing biological systems. Federal resource management agencies must examine the implications of management actions and development decisions on regional and local biodiversity.

The major grassland, shrubland, woodland, and forest types would, at the regional ecosystem level, define the primary scale of analysis for the proposed project. The major ecosystem types extend over hundreds of square miles. In addition, a more detailed, local scale of analysis considers much smaller land areas encompassing community types of limited extent or specialized requirements. Examples of these more localized ecosystems include streams and rivers, the riparian zone associated with streams and rivers, natural wetlands, and wetlands associated with manmade facilities such as irrigation canals. The primary factors that alter biodiversity at the scales discussed above include climate and human activities. Elements of biodiversity that are directly affected by the activities associated with a water supply development project include the composition and abundance of native vegetation species and fishery and wildlife populations. Threatened and endangered species represent a special category of biodiversity because of their vulnerability to small habitat alterations. Human activities that influence biodiversity include habitat fragmentation from construction or corridors and settlements; agricultural activities, including diversion of streams for irrigation and the use of pesticides; livestock grazing, and forestry; and surface disturbance associated with mineral extraction.

In relation to the proposed project, the topics in this PR/FEIS that are related to maintenance or loss of biodiversity include vegetation (upland and wetland/riparian), special status species, wildlife, and fisheries (see the “Vegetation Resources,” “Special Status Species,” “Wildlife Resources,” and “Aquatic Resources” sections). Changes to water regimes and habitat types, such as conversion of upland vegetation to a pump station, could affect species diversity locally and within a watershed. Notably, habitat for such threatened and endangered species, such as the Mesa Verde cactus, could be at risk due to this conversion, but “nonprotected” wildlife that are equally important to biodiversity could also be affected.

In the context of maintaining biodiversity, the concept of resource sustainability has guided the planning of the proposed project and the preparation of this environmental analysis. In this PR/FEIS, the concept of “sustainability” refers to the maintenance of a landscape and lifestyle in some agreed-upon form that includes both a space for human economic activity and a space to preserve the ecosystem under natural controls and evolution. Sustainability presumes a certain value in the natural landscape and seeks to preserve a functioning remnant of that world under the pressure of human presence.

To this end, Reclamation is taking an ecosystem approach to mitigating the impacts of the proposed project. The incorporation of native seeds for revegetation of disturbed areas’ association with pipeline construction, and the acquisition and management of a

single tract of land to enhance wetland/riparian habitats, would benefit the diversity of plant and animal species in an area that has or will continue to undergo habitat fragmentation as a result of development. Although the proposed project may locally reduce biodiversity, species' composition and populations are not static, and project effects with appropriate mitigation are unlikely to exceed natural variability or the variability attributed to activities unrelated to the proposed project. It is important to note that the SJRPNM Alternative may actually enhance biodiversity when compared to the No Action and NIIP Amarillo Alternatives by providing additional water to the San Juan River between Navajo Reservoir and the SJRPNM intake structure.

Climate Change

There is a large body of literature on climate change and anthropogenic global warming. There is no doubt that the climate has changed and we have seen an increase in average global temperature over the past several decades. Warming is reflected by a number of indicators including, but not limited to: glaciers are retreating, permafrost is melting, arctic sea ice is thinning, flowers are blooming earlier, and bird migration and nesting dates are changing (National Academy of Sciences, 2006).

Keller-Bliesner Engineering, LLC, was contracted by Reclamation to conduct a literature search and prepared the report entitled, "Potential Effects of Climate Change on the Hydrology of the San Juan Basin and Navajo-Gallup Water Supply Project" (2008), to analyze potential impacts of climate change to endangered species. This report is included in volume II as appendix C, part IV.

There has been considerable research in the Colorado River Basin as a whole in regard to changes in hydrology due to climate impacts with significant differences in study results. There is relatively little information specifically related to climate modeling of the San Juan River Basin. The only document specifically on the Basin found in the literature search conducted by Keller-Bliesner Engineering, LLC was a fairly old (from a climate modeling perspective) study done by Wilby (1999) and published in the *Journal of Hydrology*. However, after discussions with Christensen and Lettenmaier, it was revealed that during studies conducted for their work, "A Multimodel Ensemble Approach to Assessment of Climate Change Impacts, 2007," some detail for the San Juan River Basin was included. This work appears to be the most detailed to date related to the impact of climate change on the hydrology of the Basin. Christensen and Lettenmaier provided this work to Keller-Bliesner Engineering, LLC, and it was used as the basis for assessing the impacts to endangered species from climate change in the biological assessment.

The Christensen and Lettenmaier work addressed changes in temperature, precipitation, runoff, and evaporation that may occur as predicted by 11 general circulation models, 2 different future emission scenarios, and 3 time periods. Generally, for the time period

2070 to 2099 compared to historic conditions, mean temperature is predicted to increase in the range of 2.7 to 4.4 degrees Celsius, and precipitation is predicted to decrease from 1 to 2 percent. Other predicted changes include:

- An earlier, warmer spring
- A drier, warmer summer
- A shift in precipitation from summer to winter
- Peak runoff to the San Juan River occurring about 1 month earlier
- An increase in spring runoff monthly flows
- A decrease in summer runoff and summer base flows
- An increase in evaporation
- Increases in irrigation demand (may occur as a result of increased summer temperatures and decreased precipitation)

The impact to total runoff to the San Juan River is expected to be from -38 percent to +8 percent.

These changes could reduce the available water supply and affect the ability of the system to meet the Flow Recommendations promulgated by the SJRBRIP. However, the changes are sufficiently complex that an estimation of the impact on Flow Recommendations is not possible for a detailed analysis. The biological opinion (volume II, appendix C, part III) states: “. . .to the extent that climate change reduces the amount of available water in the river, it is anticipated that negative impacts could occur because simultaneously there will be an increased demand for human uses. The effect of earlier spring runoff on fishes is unknown and will need to be monitored.” All water development projects in the San Juan River Basin may potentially be affected by climate change, so the impacts go to the heart of the SJRBRIP and its dual goals to recover the endangered fish while water development proceeds.

OTHER IMPACTS CONSIDERATIONS

Indirect Effects

Population in the project area has been limited by the lack of dependable domestic water supplies. Population trends are expected to remain consistent with the proposed project. Population projections, as shown in volume II, appendix A, predict a 2.48 percent population increase on the Navajo Nation, a 1.7 percent increase on the Jicarilla Apache Nation, and a 1.82 percent increase in the city of Gallup.

Many of the Navajo communities in the proposed project service area that do have a piped water supply rely on wells with a limited water supply. The proposed project would allow these communities to provide an adequate water supply for their future population and commercial needs.

The city of Gallup currently relies on groundwater pumping to supply water to its residents. The water level in the city's wells has been falling by 7 to 29 feet per year over an extended period, and at some point, the production capacity of the current well system is expected to diminish. Therefore, without the proposed project, the city of Gallup would be faced with some combination of the following scenarios: (1) development of alternative water supply projects, (2) diminishing per capita water supply, and/or (3) curtailment of population growth. The city has not been able to identify any other water supply project that is as cost effective as this project. Without new water, it is estimated that the available water per capita would fall to less than one-half of existing water use by the year 2033. Thus, without the proposed project, the city of Gallup would have to make major changes in water use patterns, with consequential negative implications for the city's economic well-being. Accordingly, one project impact is to prevent the overall economic losses to the city that would occur if future water shortages caused residents and businesses to locate elsewhere.

The Jicarilla Apache Nation has established a policy of developing the southwest portion of its reservation. To attract housing and commercial enterprises to that area, they must develop a reliable, sustainable water supply. The Jicarilla Apache Nation has no adequate local water sources capable of providing such a water supply, so they have investigated various alternatives for importing water from nonlocal sources. Of the alternatives investigated, the proposed project offers the best combination of reliability and cost effectiveness. Therefore, the effect of the proposed project would be to facilitate the Jicarilla Apache Nation's plans to diversify their reservation, both residentially and economically.

Connected, Cumulative, and Related Actions

The Council on Environmental Quality regulations for implementing NEPA require the determination of short- and long-term impacts, direct and indirect, irreversible and irretrievable commitments of resources, and unavoidable adverse impacts. The regulations also call for the consideration of the relationship of the proposed action and its impacts to other projects and activities in the area. The relationship can be direct, indirect, or cumulative in nature. Connected actions are those actions that are interrelated with the proposed action; cumulative actions are those actions, which, when viewed with other proposed actions, have cumulatively significant impacts; and related actions are those actions which, when viewed with other proposed actions, have similarities to the proposed action that provide a basis for evaluation together, such as common timing or geography.

Connected actions include Navajo Reservoir Operations and the SJRBRIP. Cumulative and related actions include operations of the Navajo Unit; Dolores, Pine River, Florida, and Mancos Projects; ALP Project; the NIIP; San Juan-Chama Project, the San Juan

River Irrigation Projects; the proposed Desert Rock Energy Project; all Indian Health Service Navajo domestic water supply projects; the JANNRWSP, and the pending Navajo Settlement Agreement.

Because the United States owns and operates Navajo Reservoir and has ESA and Tribal/Nation trust responsibilities in the Basin, the proposed project is designed to accommodate, to the extent possible, overlapping concerns. The actions described below summarize these United States' responsibilities and how they are affected by the proposed project.

Navajo Reservoir Operations and the San Juan River Basin Recovery Implementation Program

The operation of Navajo Reservoir is a connected action to the proposed project and other water resource activities in the Basin such as the NIIP and ALP Project. This connection stems from:

- (1) Past ESA consultations that established and relied upon the SJRBRIP and listed certain RPAs in question
- (2) San Juan River Flow Recommendations developed and approved by the SJRBRIP
- (3) Reclamation's commitment as described in the Navajo Reservoir Operations FEIS to operate Navajo Reservoir to assist in meeting the Flow Recommendations for endangered fish in the Basin

Consideration of Navajo Reservoir operation issues and impacts (e.g., flow regimes, riparian impacts, reservoir levels, reservoir recreation issues, trout fishing, and habitat uses) were included in this PR/FEIS and the Navajo Reservoir Operations FEIS (Reclamation, 2006). Reclamation has completed the environmental compliance process for Navajo Reservoir operation, which is separate from, but coordinated with, the proposed project PR/FEIS.

Background Information.—Navajo Dam and Reservoir is owned, operated, and maintained by Reclamation. Navajo Dam is located on the San Juan River about 44 miles upstream from Farmington, New Mexico. The reservoir created by the dam extends into the State of Colorado. The Navajo Unit is a storage unit of the CRSP and is subject to the terms of the Upper Colorado River Basin Compact, the Colorado River Storage Project Act of April 11, 1956 (70 Stat. 105), and the Act of June 13, 1962, authorizing the San Juan-Chama Project and the NIIP. Since its original authorization,

the Congress has approved the use of Navajo Reservoir to fulfill a portion of the Jicarilla Settlement Act; such use is within the authorized purposes of the Navajo Unit.

After completion of the Navajo Unit in December 1963, the focus of the criteria for releasing water from the dam was primarily on flood control, NIIP supplies, and water storage.

However, in the 1990s, the focus of the criteria and associated pattern of releasing water from the dam changed. The new focus included the needs of the endangered fish species, such as the Colorado pikeminnow and the razorback sucker, in the San Juan River. Criteria for reservoir operation decisions that include the needs of endangered fish in the San Juan River are fairly new to the operations decision process of the Navajo Unit. Operations that result from implementing the Flow Recommendations for endangered fish are different than historic operations of the first 30 years after completion of Navajo Dam. The Navajo Reservoir FEIS documents these changes (Reclamation, 2006).

Animas-La Plata Project

The ALP Project, located in southwestern Colorado and northwestern New Mexico, is being implemented as a settlement of the Colorado Ute Settlement Act. At full development, the ALP Project will deplete about 57,100 acre-feet from the Basin.

As of October 1, 2008, construction was approximately 64 percent complete on the ALP Project, and it is anticipated to be completed in 2012 or 2013. Implementation of the SJRBRIP is the key element of the RPA²⁵ for section 7 consultation under the ESA that would permit completion of the ALP Project.

Navajo Indian Irrigation Project and San Juan River Irrigation Projects

The NIIP, a participating project of the CRSP, was authorized on June 13, 1962 (P.L. 87-483, as amended by P.L. 91-416 on September 25, 1970). Its principal purpose is to irrigate 110,630 acres of land owned by the Navajo Nation in northwestern New Mexico, generally south of Farmington. Water is delivered from Navajo Dam through a series of tunnels, canals, and pipelines to the sprinkler systems that irrigate agricultural land. The proposed project began operation in 1976 with the first of 11 Blocks; it was scheduled for completion in 1986, but funding delays have postponed the completion.

²⁵ Regulations implementing the ESA, section 7, define RPAs as alternative actions that avoid jeopardy identified during formal consultation with the Service.

In 1991, a biological opinion was completed for the first 8 Blocks. The biological opinion required that depletion be limited to that required for Blocks 1 through 6, 133,000 AFY, plus 16,420 AFY transferred from land not presently irrigated in the Hogback Project. Given that a substantial portion of the acreage in Blocks 1 through 6 was in conservation reserve, this allowed construction through Block 8. The acreage through Block 8, which was completed and in full operation in 2002, totals about 76,481 acres.

In 1999, a biological assessment was prepared and letter of concurrence from the Service was received by BIA allowing completion of all 110,630 acres of irrigated land in 11 Blocks with an average annual depletion of 280,600 acre-feet. This depletion is included in the baseline used to analyze the impacts of the proposed project on water supply and the ability to meet the SJRBRIP Flow Recommendations. Eventually, the proposed project depletions will drop to 270,000 AFY as return flows reach equilibrium. No additional environmental compliance analysis pursuant to NEPA is planned for completion of the NIIP.

The San Juan River Irrigation Projects include the Hogback, Fruitland-Cambridge, and Cudei Projects along the San Juan River. These BIA projects were initiated between 1900 and 1937. As of 2000, these projects provided irrigation water to about 5,300 acres. A summary of the San Juan River Irrigation Projects is as follows:

- (1) The *Hogback Irrigation Project* supplies water for lands on the north side of the San Juan River, from the Hogback, located about 9 miles east of Shiprock, New Mexico, to about 17 miles northwest of Shiprock. In recent years, the acreage irrigated under the Hogback Irrigation Project has ranged from an estimated 2,580 acres to about 2,830 acres. In 1991, 16,420 AFY of depletion of the inactive portions of the Hogback Irrigation Project was applied to the NIIP for ESA consultation purposes. Construction of NIIP Blocks 1 through 8 was to proceed while research on endangered fish recovery took place.
- (2) The *Cudei Project* supplies water for lands on the south side of the San Juan River about 6 miles northwest of Shiprock. In recent years, the acreage irrigated under the Cudei Project has ranged from an estimated 290 acres to 390 acres. The Cudei diversion dam was removed in 2002, and supply to the project was provided via a siphon from the Hogback main canal.
- (3) The *Fruitland-Cambridge Irrigation Project* diversion dam and headworks are located 2 miles west of Farmington, New Mexico, on the south bank of the San Juan River. In recent years, the acreage irrigated under the Fruitland-Cambridge Irrigation Project has ranged from an estimated 1,950 acres to about 2,140 acres.

The Navajo Nation projects account for over 300,000 acre-feet of the depletions in the baseline. In the event that the sum of all the actual depletions that are included in the depletion baseline, including the project depletion, exceeds the level of depletion that is currently allowable within the Flow Recommendations, the Navajo Nation commits to reducing its total depletion to stay below the allowed total for the Basin. This could be accomplished by changes in operation of any of the Navajo projects that deplete water from the San Juan River. By way of example, the operation of irrigation projects adjacent to the San Juan River could be limited to use less than the full allowed depletion, the operation of the Navajo portion of the project could be modified to reduce use, or the NIIP could be modified in terms of service acreage, fallow land, or crop mix change to reduce demand. The maximum guaranteed requirement is 20,782 acre-feet, and changes in the Flow Recommendations or in species status may result in a reduction or removal of this guarantee in the future.

Desert Rock Energy Project

Sithe Global Power, LCC (Sithe Global) proposes to construct a hybrid dry-cooled, coal-fired, 1,500-megawatt (mW) electrical power generating plant approximately 30 miles southwest of Farmington, New Mexico, on the Navajo Indian Reservation. Sithe Global is developing the project with the Diné Power Authority, an enterprise of the Navajo Nation.

The primary components of the proposed project include:

- Two 750-mW, coal-fired generating units and associated facilities and operations including a plant cooling system; flue-gas cleaning equipment to reduce sulfur dioxide, nitrogen oxide, and mercury emissions; a fuel supply system; waste management operations; and safety systems
- Water supply infrastructure (e.g., water well field, pipeline)
- Power transmission interconnection facilities
- Access roads
- Construction staging areas
- Coal from Areas IV South and V of the BHP Navajo Coal Company Lease Area

A draft environmental impact statement was completed by the BIA, the lead Federal agency for preparing the document, in June 2007, and the FEIS is expected to be completed in spring 2009.

Jicarilla Apache Nation Navajo River Water Supply Project

The Jicarilla Settlement Act (106 Stat. 2237) was enacted in 1992. The water delivery provisions for future uses of the Jicarilla Settlement Act mandated certain requirements to be fulfilled before the water could be available for Tribal use. All of these requirements have been met, and on February 23, 1999, the Eleventh Judicial District Court, County of San Juan, State of New Mexico, entered a Partial Final Judgment and Decree adjudicating the Nation's water rights in the San Juan River system. Thus, the Jicarilla Settlement Act is now in full effect and provides the Nation the right to divert 6,500 AFY of San Juan-Chama Project water from Heron Reservoir and the right to divert 33,500 AFY from Navajo Reservoir or the Navajo River, of which 25,500 AFY may be depleted. The Jicarilla Apache Nation also has the right to market third-party subcontracts, the water to which the Nation is entitled from the Navajo Reservoir water supply and the San Juan-Chama Project under the settlement contract for off-reservation uses, subject to the approval of the Secretary and to requirements and conditions of applicable Federal and State law and interstate compacts, including the Partial Final Judgment and Decree adjudicating the Nation's water rights in the Basin in New Mexico. The Jicarilla Apache Nation's water rights, based on historic and existing uses on their reservation, were also quantified, with a total annual diversion of 5,683 AFY, or the quantity of water necessary to supply a depletion of 2,195 AFY, whichever is less, and a net evaporation from existing stock ponds and reservoirs of 2,187 AFY.

Presently, the 25,500 AFY of Navajo Reservoir water supply contract depletion rights of the Jicarilla Apache Nation are allocated to the following uses: 16,200 acre-feet to the PNM for use at the San Juan Generating Station, 770 acre-feet to minor subcontracts, 6,654²⁶ acre-feet for the proposed JANNRWSP, and 1,876 acre-feet remain unallocated. In addition, the Nation has 2,190 acre-feet of historical use rights, of which 1,846 acre-feet were committed to the JANNRWSP and 346 acre-feet are presently used for M&I purposes. The plans for the JANNRWSP include the allowance to divert all or part of water presently allocated for the JANNRWSP to other uses, including the proposed Navajo-Gallup Water Supply Project, at a time it should be needed. For purposes of this project analysis, it is assumed that the JANNRWSP would divert no future use water, 220 acre-feet of the historical water would be used for other purposes, and 8,700 acre-feet would be delivered to the proposed Navajo-Gallup Water Supply Project (6,570 acre-feet previously committed to the JANNRWSP plus 1,960 acre-feet of additional future use water and 170 acre-feet of other water) to meet full demands anticipated from the Jicarilla Apache Nation's water rights.

²⁶ San Juan River Basin Hydrology Model that shows average project depletion of 6,570 acre-feet.

Cumulative Impacts

The projects listed above would have cumulative impacts when taken in conjunction with the completion of this proposed project. The following describes the impacts by project.

Operation of Navajo Dam

The operation of Navajo Dam to mimic the natural hydrograph of the San Juan River by implementing the SJRBRIP Flow Recommendations is a major element of the Long Range Plan to facilitate recovery of endangered fish species. In the past, the Service has relied on implementation of the Flow Recommendations as a primary mechanism to support ESA compliance for continued water development in the Basin. The SJRBRIP may serve as the RPA or RPM for additional water development in the Basin as described in the SJRBRIP principles document (attachment O). In 1991, the status of endangered fish in the San Juan River made additional water depletions in the Basin uncertain.

The San Juan River Basin Hydrology Model was developed by Reclamation and BIA for support of the Flow Recommendations process, with oversight and model review by an ad hoc modeling group made up of hydrologists representing the various interests in the Basin. The model was used initially to analyze the ability of the San Juan River system to be operated to meet the Flow Recommendations and to assess the impacts of future development on that ability. Operating criteria were developed as part of the Flow Recommendations that would allow Flow Recommendations to be met with the development of additional water in the Basin. However, as noted in the report, *Flow Recommendations for the San Juan River* (Holden, 1999), the operating criteria specified were not optimized to maximize developable water. As presently configured, the Flow Recommendations may also allow for a significant amount of future water development in the Basin.

Following the completion of the Flow Recommendations report, the model became available for the assessment of water development project impacts on the ability to meet the Flow Recommendations. When applied for this purpose, modification of operating criteria to optimize system operations was anticipated.

The model is an ongoing process of review and improvement. The current model configuration indicates that Navajo Dam can be operated to meet the demands of the proposed project, in addition to all depletions in the baseline (table V-3), while minimally impacting meeting the Flow Recommendations. All but two of the flow criteria are met for the worst-case scenario, and these criteria have been determined by the SJRBRIP to be ineffective in accomplishing the anticipated results (Miller, 2005). The 2,500 cfs

criteria are missed by about 12 percent for 3 days in 1 year out of the 65-year period, or 0.01 percent of the time. All other Flow Recommendations criteria are fully met.

Reclamation prepared an FEIS for Navajo Reservoir Operations (Reclamation, 2006) to evaluate impacts associated with implementing the Flow Recommendations. The EIS evaluated a No Action Alternative and 250/5000 and 500/5000 Alternatives. The No Action and 500/5000 Alternatives do not fully meet the Flow Recommendations. Reclamation identified the 250/5000 Alternative as the preferred alternative and will implement the 250/5000 Alternative after the ROD has been executed.

The model, in its present configuration, represents the best science available to assess the impacts the proposed project on the ability to meet Flow Recommendations for endangered fish and to test operating rules designed for that purpose. The presently defined operating rules and model configuration do not indicate availability for substantial additional depletions in the Basin with the present Flow Recommendations without the SJRBRIP serving as the RPA for adverse impacts to endangered fish. The Navajo Depletion Guarantee, as previously discussed, would allow the proposed project's full development without exceeding the level of depletions specified in the baseline.

Animas-La Plata Project

Full development of the water supply made available by completion of the ALP Project will increase depletions in the Basin by about 57,100 acre-feet. The biological opinion relies on implementation of the Flow Recommendations through reoperation of Navajo Reservoir to avoid jeopardy to the Colorado pikeminnow and razorback sucker.

Navajo Indian Irrigation Project

Completion of the NIIP will increase depletions on the San Juan River by about 120,580 AFY under equilibrium conditions and by about 131,180 AFY until return flows reach equilibrium. The 1999 biological assessment and letter of concurrence from the Service provided ESA compliance for construction to proceed up to the full level of development, using a large portion of the remaining developable water within the Basin.

Desert Rock Energy Project

Construction of the Desert Rock Energy Project could overlap with the construction footprint of the proposed project. Water well fields, pipelines, and power-transmission interconnect facilities may cross or run parallel to some of the proposed project facilities.

Jicarilla Apache Nation Navajo River Water Supply Project

At full project development, the JANNRWSP, if implemented, would divert up to 12,000 AFY from the Navajo River, resulting in a depletion of 8,500 AFY on average. Of the 8,500 AFY average depletion, 6,654 AFY on average is considered a new depletion that would be sourced from the Navajo River through the Jicarilla Apache Nation's settlement contract with the Secretary (Service, 2004). The Jicarilla Apache Nation, pursuant to the Jicarilla Settlement Act, has a right to deplete up to 25,500 AFY from the Navajo River or Navajo Reservoir pursuant to the Nation's settlement contract with the Secretary. The Jicarilla Apache Nation currently has subcontracted 16,200 AFY to the San Juan Generating Station and 770 AFY to minor subcontractors. The Nation has the right to temporarily or permanently reduce the water supply made available under the 8,500 AFY subcontracted in order to supply the proposed project or to utilize the water on-reservation, including the JANNRWSP.

Under the proposed project, it is assumed that the JANNRWSP would not divert future use water, 2,020 acre-feet of historical water right would be used for other purposes, and 8,700 acre-feet would be delivered to the proposed project (6,570 acre-feet previously committed to JANNRWSP plus 1,960 acre-feet of additional future use water and 170 acre-feet of other water) to meet the full demands anticipated from the Jicarilla Apache water right.

San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement

On April 19, 2005, the State of New Mexico and the Navajo Nation signed the Navajo Settlement Agreement (Navajo Nation - State of New Mexico, 2005). Once executed by the Secretary, the agreement will resolve the claims of the Navajo Nation to the use of waters of the Basin in New Mexico. The Navajo Settlement Agreement is intended to provide water rights and associated water development projects, including the proposed project, for the benefit of the Navajo Nation in exchange for a release of claims to water that potentially might otherwise displace existing non-Navajo water uses in the Basin in New Mexico.

The Omnibus Public Land Management Act of 2009 (P.L. 111-11) approved, ratified, and confirmed the Navajo Settlement Agreement under Title X, Part IV of the act. This PR/FEIS does not analyze the Navajo Settlement Agreement; however, the act requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010. Additional NEPA compliance may be needed to implement other portions of the agreement (Fruitland-Cambridge, Hogback-Cudei, conjunctive use groundwater wells, and others).

Relationship Between Short-Term Uses and Long-Term Productivity

This section discusses the short-term use of man’s environment that would be required to construct and implement the proposed project alternatives and the long-term productivity that would result from operation of the proposed project.

Short-term use of man’s environment refers to either the actual use of resources during construction (e.g., energy, manpower, and monetary investments) or impacts to environmental resources that would occur during construction or as a result of operation. Long-term productivity refers to the benefits that would be realized during operation of the proposed project. In most instances, short-term use of (or impacts to) a given resource would not have a directly corresponding long-term benefit to the resource. Additionally, certain long-term impacts would occur to some resources. These impacts are discussed in detail in the “Affected Resources” section.

The following sections discuss (1) the long-term productivity that would result from the operation of the SJRPNM and NIIP Amarillo Alternatives and (2) the short-term use of resources that would be required to realize such productivity.

Long-Term Benefits and Productivity

Long-term benefits that would be realized from implementation of the SJRPNM Alternative include:

- Providing dependable domestic water supplies for current and future needs of the Navajo Nation, Jicarilla Apache Nation, and the city of Gallup
- Increased development and employment opportunities and associated revenues to the Navajo Nation, Jicarilla Apache Nation, city of Gallup, and other area residents and businesses as a result of water deliveries

- A reduction of impacts to aquatic and river recreation resources from Navajo Dam to the SJRPNM intake structure as identified in the No Action Alternative
- Provision of a much-needed M&I water supplies to the Navajo Nation that assist the possibility of settling the Navajo Nation water right claims in the Basin

Long-term benefits that would be realized from implementation of the NIIP Amarillo Alternative would be the same as those identified above, with the exception of reduced impacts to aquatic and recreation resources as identified in the No Action Alternative.

Short-Term Uses of Resources

Resources that would be required for construction and operation of the SJRPNM Alternative include construction materials, energy, land, manpower, and monetary expenditure. (Specific project requirements for construction and operation are described in Chapter IV–Alternatives of this PR/FEIS). Additionally, commitments of certain resources would result from impacts that would occur during construction and operation of the structural components, water end uses, and water conveyance systems. These commitments or impacts would indirectly allow for the long-term benefits of the proposed project, as described in the next section. Such commitments include a commitment of water storage resources in Navajo Reservoir, disturbance of cultural resources, changes in land use, destruction of riparian and wetland habitats, and increased traffic congestion associated with construction traffic at project features and pipeline locations.

Resources required for construction and operation of the NIIP Amarillo Alternative would differ slightly from those required for the SJRPNM Alternative. Construction of the NIIP Amarillo Alternative would require more construction materials, energy, land, and monetary expenditures. Operational expenditure required for the NIIP Amarillo Alternative would be less than that required of the SJRPNM Alternative. Specific project requirements for construction and operation are described in Chapter IV–Alternatives of this PR/FEIS. Additionally, “commitments” of certain resources would result from impacts that occur during construction and operation of the structural components, water end uses, and water conveyance systems. These commitments, or impacts, would indirectly allow for the long-term benefits of the project, as described in the next section. Such commitments include a commitment of water storage resources in Navajo Reservoir, disturbance and inundation of cultural resources, inundation of upland habitats, changes in land use, destruction of riparian and wetlands habitats, and increased traffic congestion associated with construction traffic at project features and pipeline locations.

Irreversible and Irrecoverable Commitments of Resources

The irreversible and irrecoverable commitments of certain resources would be required to implement the proposed project. Irreversible and irrecoverable commitments would occur from the use of resources for the construction and operation of the proposed project features and land acquisition and would also occur through impacts to resources as a result of implementation of the proposed project alternatives.

For purposes of this section, the irreversible commitment of a renewable resource means that following the decision to take certain actions that would result in the utilization or loss of a given resource (in part or whole), either the decision could not be changed or the action could not practicably be reversed due to physical or economical constraints. The irrecoverable commitment of a resource is defined as the loss of future options and/or a given resource. Consequently, a resource used for the construction and/or operation of the proposed project would be an irrecoverable commitment of a resource. Additionally, the loss of a resource resulting from project impacts, such as disturbance of cultural resources, inundation of upland habitats, destruction of riparian and wetland habitats, and increased traffic congestion associated with construction traffic, would be considered an irrecoverable commitment of that resource. For example, once water is diverted from a river and put to particular use, it cannot feasibly be retrieved and, as such, would be considered an irrecoverable commitment of resources. However, the decision and physical action to divert the water is not irreversible. If policy, legislative, or management decisions were made to end the diversion of water to a particular use, then diversion facilities could be reconfigured accordingly, and the commitment of the water to that use would be reversed.

Resources that would be used for the construction and operation of the SJRPNM and NIIP Amarillo Alternatives' structural components and end uses and conveyance systems include:

- Construction materials
- Energy resources, such as fuel for construction equipment and electricity for operating pumps
- Manpower for construction and operation
- Financial resources
- Cultural resource destruction

Additionally, the operation of potential end uses of project water would, by definition, consume water and would also consume other resources such as electricity and natural gas (as Tribal Nation communities and the city of Gallup develop and expand to meet future population demands).

The decision to commit resources for the construction of the SJRPNM and NIIP Amarillo Alternatives would be irreversible once construction activities had taken place. The energy, manpower, and other resources that would be used for development of the proposed project facilities would be foregone following construction of the facilities, and reusing these resources for alternative purposes would not be feasible.

The decision to commit water to a particular use, however, would be reversible. The Navajo and Jicarilla Apache Nations and the city of Gallup plan to use project water for domestic purposes. While the water for these uses could not feasibly be retrieved, the decision to commit this water to a particular purpose could be reversed. It is possible that with this timespan, economic circumstances could arise or technical advances could occur that would influence decisionmakers to alter the operational specifications of particular project features, thereby changing the resources necessary for operation or creating an opportunity to put such water to a more beneficial use. These decisions could result in a reduction or elimination of the further consumption, thereby reversing the resources' commitment.

CONCLUSIONS AND SUMMARY OF IMPACTS

Table V-17 (at the end of this chapter) provides a summary of impacts associated with the No Action, SJRPNM, and NIIP Amarillo Alternatives.

Under the No Action Alternative, the proposed project would not be constructed and a lack of dependable municipal water supplies would likely limit existing communities and future growth.

The main impact of the proposed project would be a reliable water supply. The SJRPNM and NIIP Amarillo Alternatives would deplete 35,893 acre-feet of water from the Basin to supply water in New Mexico and Arizona for project purposes, and dependable water supplies would be available to the Navajo and Jicarilla Apache Nations, and the city of Gallup to meet existing and future municipal water demands. Both alternatives have potential adverse impacts to beautiful gilia and Mesa Verde cactus. Grazing activities and paleontological resources adjacent to the pipeline corridors would likely be impacted during the construction phase of the SJRPNM and NIIP Amarillo Alternatives.

The SJRPNM Alternative would increase San Juan River mean average flows by 4.6 cfs, which is predicted to have beneficial impacts on water quality, aquatic resources, and

recreation resources below Navajo Dam. Under the SJRPNM Alternative, 31,686 acres could be temporarily disturbed for pipeline construction and 43 acres permanently removed for project features, including 1.1 acres of wetland habitat. Seventeen acres of non-native riparian vegetation would be removed and revegetated with native riparian species. Potential entrainment of larval Colorado pikeminnow, razorback sucker, bluehead sucker, flannelmouth sucker, and speckled dace may occur under the SJRPNM Alternative at the PNM diversion on the San Juan River; however, the amount of entrainment is not predicted to be significant. An estimated 104 cultural resource sites may occur within the SJRPNM Alternative's area of potential effect, and 80–90 cultural resource sites may be impacted. Other impacts associated with the SJRPNM Alternative are presented in table V-17.

The NIIP Amarillo Alternative would decrease San Juan River mean average flows by 4.0 cfs, with limited negative impacts on water quality, aquatic resources, and recreation resources below Navajo Dam. Under the NIIP Amarillo Alternative, 31,841 acres could be temporarily disturbed for pipeline construction and 249 acres permanently removed for project features, including 0.1 acre of wetland habitat. An estimated 183 cultural resource sites may occur within the SJRPNM Alternative's area of potential effect, and 145 cultural resource sites may be impacted. Other impacts associated with the NIIP Amarillo Alternative are presented in table V-17.

Based on the analysis conducted in chapters IV and V, the SJRPNM Alternative has been identified as the preferred alternative.

Table V-17.—Summary of Impacts

Resource	No Action Alternative	SJRPNM Alternative	NIIP Amarillo Alternative
Water uses and water resources	No significant changes. ¹	Increases Navajo Reservoir mean elevation by 1.3 feet .	Increases Navajo Reservoir mean elevation by 0.9 foot .
		Increases San Juan River mean average flow by 4.6 cfs	Decreases San Juan River mean average flow by 4.0 cfs
		Flow Recommendations met 99.9% of the time. All but two flow criteria met for the worst-case scenario.	
		35,893 acre-feet total depletion; New Mexico—29,482 acre-feet; Arizona—6,411 acre-feet	
Indian Trust Assets	Lack of dependable municipal water supply for existing communities and future growth.	Navajo Nation uses 20,782 acre-feet in New Mexico and 6,411 acre-feet in Arizona for dependable municipal water supply for existing Navajo communities and future growth.	
		Navajo Depletion Guarantee of 20,782 acre-feet used to stay within existing San Juan River baseline.	
		1,200 acre-foot Jicarilla Apache Nation on-reservation demand met using a portion of the Jicarilla Settlement Act and potential for third-party contract for 7,500 acre-feet to the city of Gallup for the remaining portion.	
		May impact development of future use water from the Colorado Ute Settlement Act.	
Water quality	Water quality degradation would continue in low flow periods.	Water quality benefit from slight decrease in concentrations of contaminants below Navajo Reservoir.	Same as No Action.
		NPDES permitted facilities above the PNM diversion would benefit from increased flow during critical low flow conditions.	Same as No Action.
Vegetation resources	No significant changes. ¹	31,686 acres of temporary disturbance.	31,841 acres of temporary disturbance.
		43 acres of permanent loss for project features.	249 acres of permanent loss for project features.

Table V-17.—Summary of Impacts (continued)

Resource	No Action Alternative	SJRPNM Alternative	NIIP Amarillo Alternative
Vegetation resources (continued)	No significant changes. ¹	Permanent loss of 0.09 acre of non-native riparian shrub habitat for project features.	Same as No Action.
		Benefit from removal of 17 acres of non-native riparian vegetation along the San Juan River and revegetated with native riparian vegetation.	
	Potential loss of wetlands associated with changes in irrigation.	Permanent loss of 1.1 acres of wetlands (1.0 acre adjacent to the PNM Diversion Dam and 0.1 acre below Cutter Reservoir).	Permanent loss of 0.1 acre of wetlands below Cutter Reservoir.
	No significant changes. ¹	3.6 acres of temporary impact to wetlands along the San Juan River.	Same as No Action.
Wildlife resources	No significant changes. ¹	Temporary disturbance of 31,686 acres of marginal wildlife habitat.	Temporary disturbance of 31,841 acres of marginal wildlife habitat.
		Permanent loss of 43 acres of wildlife habitat.	Permanent loss of 249 acres of wildlife habitat.
		Temporary impacts to 23.86 acres of key wildlife habitat.	Temporary impacts to 3.26 acres of key wildlife habitat.
		Loss of 1.19 acres of key wildlife habitats.	Loss of 0.1 acre of key wildlife habitats.
		Construction of 19.2 miles of transmission line through raptor cliff-nesting habitat and potential avian collision risk.	
Aquatic resources	No significant changes. ¹	Flow Recommendations met 99.9% of the time. All but two flow criteria met for the worst-case scenario.	Same as No Action.
		Potential beneficial impacts to native and tailwater trout fisheries associated with increased flows below Navajo Dam.	
		Potential entrainment losses at PNM diversion for flannelmouth sucker and speckled dace larvae.	

Table V-17.—Summary of Impacts (continued)

Resource	No Action Alternative	SJRPNM Alternative	NIIP Amarillo Alternative
Special status species	No significant changes. ¹	Flow Recommendations met 99.9% of the time. All but two flow criteria met for the worst-case scenario.	No effect.
		Potential entrainment losses at PNM diversion for Colorado pikeminnow, razorback sucker, and bluehead sucker.	
		Potential impacts to bald eagle and Southwestern willow flycatcher along the San Juan River.	
		Potential negative impacts to beautiful gilia and Mesa Verde cactus.	
Recreation	No significant changes. ¹	Some beneficial impacts to trout fish associated with increased releases from Navajo Reservoir.	Same as No Action.
Land use	No significant changes. ¹	Potential changes in land use associated with dependable water supply from the proposed project.	Same as No Action.
		Temporary impacts to grazing on Navajo Nation lands during pipeline construction and during revegetation.	
		20 acres of private land converted to project features.	
		23 acres of Navajo Nation lands converted to project features.	
Hazardous materials	No significant changes. ¹	15 crossings of existing natural gas pipelines.	12 crossings of existing natural gas pipelines.
		65 oil and gas wells within 500 feet of pipeline.	66 oil and gas wells within 500 feet of pipeline.
		Pipelines parallel about 40 miles of existing natural gas transmission line.	
Soils	No significant changes. ¹	9 highly erodible soil map unit types within 100 feet of proposed pipeline.	7 highly erodible soil map unit types within 100 feet of proposed pipeline.

Table V-17.—Summary of impacts (continued)

Resource	No Action Alternative	SJRPNM Alternative	NIIP Amarillo Alternative
Geology	No significant impacts predicted to geological resources.		
Paleontological resources	No significant changes. ¹	Potential impacts to paleontological resources in areas where the proposed pipeline skirts the Lybrook and Betonnie Tsoosie Fossil Areas.	
Air quality and noise	No significant impact predicted to air quality and noise.		
Socioeconomics	Continued consumption of nonpotable water not compliant with EPA standards.	Increased access to treated water for current communities and future population and economic growth.	
	No significant changes. ¹	Regional economic output estimated at \$462 million for the proposed project construction period.	Regional economic output estimated at \$523 million for the proposed project construction period.
		Regional personal income estimated at \$460 million for the proposed project construction period.	Regional personal income estimated at \$490 million for the proposed project construction period.
		Increase of 600–650 in regional employment during project construction period.	Increase of 640–690 in regional employment during project construction period.
	Project could employ an estimated 30–58 percent in local hiring.		
Environmental justice	No significant changes. ¹	Significantly benefits low-income and minority populations by increasing access to clean, dependable domestic water supplies.	
Cultural resources	No significant changes. ¹	104 cultural resource sites within area of potential effects.	183 cultural resource sites within area of potential effects.
		80–90 cultural resource sites would require treatment.	145 cultural resource sites would require treatment.

¹ No significant changes from future conditions described in the Navajo Operations EIS (Reclamation, 2006).



Chapter VI

ENVIRONMENTAL COMMITMENTS AND MITIGATION MEASURES

Introduction
General Commitments

INTRODUCTION

This chapter discusses the environmental and related commitments that have been made by the Bureau of Reclamation (Reclamation) during the development of the San Juan River Public Service Company of New Mexico (SJRPNM) Alternative (Reclamation's preferred alternative). Reclamation would share responsibility of implementing measures that would avoid or reduce potential environmental impacts of the Navajo-Gallup Water Supply Project (proposed project). This responsibility would be shared with other Federal agencies, the Navajo and Jicarilla Apache Nations, and the city of Gallup, as well as third-party entities that could include New Mexico and Arizona State agencies and local governments.

This chapter summarizes the commitments made during the planning process and incorporated into the proposed project plan. Commitments are discussed in chapter IV, and mitigation measures are proposed in chapter V to reduce or avoid impacts that would otherwise occur as a result of the implementation of the preferred alternative.

As described below, the commitments would be implemented by Reclamation, or Reclamation would require their implementation by construction contractors or management authorities. Commitments for pre-construction activities would generally be completed by Reclamation or by the contractors during the final design process and prior to construction activities. Wildlife, wetland, cultural resource, and other mitigation would be completed by Reclamation as described in the following paragraphs. Some commitments, such as monitoring, would continue beyond completion of construction of structural facilities.

GENERAL COMMITMENTS

Throughout the planning process for the proposed project, efforts have been made to avoid impacts where practicable. If avoidance was not possible, then mitigation

measures have been developed to reduce the level of impact. The proposed mitigation measures for each resource, if appropriate, were discussed in chapter V, and key measures are summarized here. In addition to specific mitigation measures identified in chapter V, other management practices would be employed during construction activities to minimize environmental effects and would be included in construction specifications. Many of these measures are required in order to comply with Federal, State, or local laws and regulations, regardless of whether they are specifically identified in this document. Reclamation would comply with all relevant Federal, State, and local laws, ordinances, regulations, and standards during the implementation of the preferred alternative. Reclamation would prepare and implement an environmental commitments plan for the proposed project to document and track the completion of the environmental commitments.

Navajo Reservoir Operations

Reclamation would be able to issue water service contracts to meet project demands from Navajo Reservoir now that a successful hydrologic determination was signed. At full San Juan River Basin (Basin) development, depletions would increase by 5,270 acre-feet from the Basin over the baseline presented in chapter V, table V-3.

Releases would be similar to those described in the *Navajo Reservoir Operations Final Environmental Impact Statement, Navajo Unit – San Juan River, New Mexico, Colorado, Utah* (Reclamation, 2006) to meet the San Juan River Flow Recommendations; however, additional flows would be released from Navajo Reservoir downstream when needed to meet project demands at the SJRPNM intake structure. The demands for the Cutter Lateral portion of the proposed project would be delivered from Navajo Reservoir through the existing Navajo Indian Irrigation Project (NIIP) intake structure in Navajo Reservoir.

Water Uses and Resources Commitments

Until depletions in the Basin reach the baseline depletion in table V-3 plus the 5,270 acre-feet added to the baseline for this project, the San Juan River Basin Recovery Implementation Program (SJRBRIP) Flow Recommendations can be met or only missed less than 0.01 percent of the time for only one category. When the total depletions reached this new baseline depletion, the Navajo Nation would reduce an amount from one or more projects that are presently in the baseline to ensure that the total depletions in the Basin remain below the baseline depletions (Navajo Depletion Guarantee).

Navajo Depletion Guarantee

The Navajo Depletion Guarantee is a commitment by the Navajo Nation which ensures that depletions for its uses under the proposed project will be offset by unused Navajo Nation depletions included in the San Juan River Basin, including forbearance of Navajo Nation uses on NIIP and/or Hogback and Fruitland Irrigation Projects as necessary, if and when required to keep the total depletions in the Basin from exceeding the following threshold (referred to as the depletion threshold):

The sum of the actual annual depletions from all uses listed in the hydrologic baseline shown in table V-3 (excluding San Juan-Chama Project exportation) and all Navajo-Gallup Water Supply Project uses equals a total depletion amount of 752,127 acre-feet per year (AFY).¹

Full proposed project depletions of 35,893 AFY would be made without requiring any forbearance of uses in excess of the 6,740 acre-feet of change in use baseline depletions shown in tables V-5 and VI-1. The city of Gallup may subcontract with either the Jicarilla Apache Nation or the Navajo Nation, or both in combination, for the diversion of up to 7,500 acre-feet of water per year from the Navajo Reservoir supply for its proposed project uses (depicted in table VI-1 as scenario 1 and scenario 2).

Depletions by the San Juan-Chama Project and other projects that may be added to the hydrologic baseline (table V-3) after the U.S. Fish and Wildlife Service's (Service) issuance of the Final Biological Opinion for the Navajo-Gallup Water Supply Project (volume II, appendix C, part III) would not be used when comparing actual future depletions against the 752,127 AFY depletion threshold.

If the threshold depletion is reached in the future, the Navajo Nation would reduce its total depletion in the Basin so that its consumptive uses under the proposed project do not cause the total actual depletions in the Basin to exceed the threshold depletions. The Navajo Nation could accomplish the required reductions in use by changes in the operation of any of the Navajo Nation's projects that deplete water from the San Juan River. The maximum Navajo Depletion Guarantee requirement in any year is a reduction in Navajo Nation depletions of 20,782 acre-feet.

When the depletion threshold condition is reached and the Navajo Depletion Guarantee must be implemented, the quantification of the threshold depletion amount will be recalculated using the baseline uses identified in table V-3 that are estimated in the most recent San Juan Hydrology Model. Changes in the Flow Recommendations for the San Juan River or the status of listed species may result in reduction or removal of the

¹ The total includes 854,370 AFY for all depletions in the hydrologic baseline, less 107,514 AFY average depletion by the San Juan-Chama Project, plus 5,271 AFY of new depletions included in the proposed project.

Table VI-1.—Summary depletions for full proposed project development

Water provider	Change in use of baseline depletion (changed used) (acre-feet)	New depletions (approved in excess of baseline) (acre-feet)	Met within total threshold depletion for Navajo Depletion Guarantee (acre-feet)	Total (acre-feet)
Scenario 1 – City of Gallup subcontract with the Jicarilla Apache Nation				
Jicarilla Apache Nation	¹ 6,740	² 1,960	0	8,700
Navajo Nation	0	6,411	20,782	27,193
Proposed project total	6,740	8,371	20,782	35,893
Total reduced for 3,100 acre-feet NIIP returns		³ 5,271		
Scenario 2 – City of Gallup subcontract with the Navajo Nation				
Jicarilla Apache Nation	⁴ 1,200	0	0	1,200
Navajo Nation	⁵ 5,540	8,371	20,782	34,693
Proposed project total	6,470	8,371	20,782	35,893
Total reduced for 3,100 acre-feet NIIP returns		³ 5,271		

¹ Includes forbearance by the Jicarilla Apache Nation of 6,750 AFY of consumptive use on the Jicarilla Apache Nation Navajo River Water Supply Project (JANNRWSP) and 170 acre-feet of consumptive use under Jicarilla water rights for historic uses.

² The Final Biological Opinion for the Navajo-Gallup Water Supply Project does not establish any right in the Jicarilla Apache Nation to retain approval for 1,960 AFY of new depletions in excess of the baseline depletions listed in table V-3 should this amount of Jicarilla water rights, over and above the change in use of 6,750 acre-feet of baseline depletion, not be required for the proposed project due to the city of Gallup subcontracting with the Navajo Nation, as shown in scenario 2.

³ By the time the Navajo Nation's water demands under the proposed project reach the full 27,193 acre-feet of depletion, the return flows from the NIIP to the San Juan River are anticipated to have increased by approximately 3,100 AFY, on average, over and above the current rate of return flow from the NIIP. This increase in return flows from the NIIP offsets an equivalent amount of new depletion by the proposed project and reduces the net new depletion from the river in the proposed project's biological opinion from 8,371 AFY to 5,271 AFY.

⁴ Includes a forbearance by the Jicarilla Apache Nation of 1,200 AFY of consumptive use on the JANNRWSP.

⁵ Includes forbearance by the Navajo Nation of 5,540 AFY of consumptive use on the NIIP or other Navajo projects for which depletions are in the baseline.

Navajo Depletion Guarantee based upon reconsultation. Additional information regarding the Navajo Depletion Guarantee is included in volume II, appendix C, part III (final biological opinion).

Monitoring Requirements.—No specific, detailed accounting of depletions will be required unless the sum of NIIP and Animas-La Plata Project (ALP) depletions reaches 290,000 acre-feet (table V-5). Since these projects are more easily tracked than depletions in the entire Basin, it will limit monitoring requirements. If this condition is met, all the depletions listed in the baseline for the proposed project will be monitored and reported on a 5-year cycle to coincide with the Reclamation Consumptive Use and Loss report. Depletions will be reported by the categories listed in the hydrologic baseline shown in table V-5 and the total computed. As discussed above, San Juan-Chama Project depletions will be removed for comparison to the Navajo Depletion Guarantee threshold depletion.

If the sum of these depletions reaches the depletion guarantee threshold, the elements of the Navajo Depletion Guarantee will be implemented. At that point, modeling will be completed for the limits the Navajo Nation proposes putting in place to meet flow conditions specified in the biological assessment.

Responsibilities.—

San Juan River Basin Recovery Implementation Program.—The SJRBRIP Hydrology Committee will be responsible for reviewing the accounting of depletions. The committee will also ensure that the San Juan River Basin Hydrology Model is implemented for compliance with the Flow Recommendations as specified in the proposed project’s biological assessment. The biological assessment contains limits identified by the Navajo Nation at the time the Navajo Depletion Guarantee is implemented.

Reclamation.—Reclamation will identify the point at which ALP and NIIP annual depletions reach 290,000 acre-feet. If that target depletion is reached, Reclamation will initiate reporting of depletions for the categories listed in the hydrologic baseline for the proposed project (table V-5) on a 5-year cycle as a part of the consumptive use and loss reporting procedure. As a result of the monitoring, Reclamation will identify the point at which the sum of actual uses reaches the Navajo Depletion Guarantee threshold. If this level of depletion is reached, Reclamation will limit deliveries to Navajo projects, as directed by the Navajo Nation, to levels required by implementation of the Navajo Depletion Guarantee. In the event that the SJRBRIP terminates, Reclamation will assume the responsibilities listed above for the SJRBRIP.

Navajo Nation.—The Navajo Nation will limit uses as specified in the Navajo Depletion Guarantee if the conditions stated above are reached and provide to the SJRBRIP and Reclamation the projects it wishes limited.

Conditions.—None of the actions and conditions listed herein shall limit the ability of Reclamation to reinitiate consultation on the proposed project to increase its baseline depletion or alter the requirements of the Navajo Depletion Guarantee.

Reclamation will notify the SJRBRIP and the States of New Mexico and Colorado of any such requests to reinitiate consultation on the proposed project. Any reconsultations on the proposed project will be performed in conformance with the SJRBRIP’s Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin that is described in the SJRBRIP’s Program Document, Appendix C, dated September 7, 2006, as may be modified by the SJRBRIP and the Service.

The depletion levels discussed are conditioned upon current estimates of natural flow and baseline depletions for 1929–93 and are subject to change as hydrology or models are updated. If such updates occur, a newly computed Navajo Depletion Guarantee shall be computed and utilized based upon the same depletion categories as described herein.

Indian Trust Assets Commitments

There are no mitigation measures proposed for Indian Trust Assets. One of the goals of the SJRBRIP is to “. . . proceed with water development in the Basin in compliance with federal and state water law, interstate compacts, Supreme Court decrees, and federal trust responsibilities to the Southern Utes, Ute Mountain Utes, Jicarillas, and the Navajos.” (SJRBRIP, 1995).

Water Quality Commitments

Reclamation would develop and implement a program to reduce, minimize, or eliminate temporary, short-term increases in suspended sediment loading or other water quality constituents potentially caused by project construction through the incorporation of permits, Best Management Practices (BMPs), and sediment control structures as described under mitigation measures for water quality in chapter V.

Vegetation Commitments

Reclamation would:

- Ensure that construction contractors limit ground disturbance to the smallest feasible areas and that they implement BMPs along with the planting or reseeded of disturbed areas using native plants to assist in the re-establishment of native vegetation as described under mitigation measures for vegetation resources in chapter V.
- Use accepted erosion control measures during construction, supplement grass seeding with native shrub seed in upland areas where shrub cover is diminished due to pipeline disturbance, monitor planting to ensure establishment, and control noxious weeds in disturbed areas.
- Replace riparian and wetland habitat with the creation of acre-per-acre replacement or enhancement of 3 acres for each acre lost to mitigate for impacts to riparian and wetland habitat. This includes revegetation of 17 acres of non-native riparian (Russian olive and tamarisk) and 3.6 acres of wetland temporarily removed during pipeline construction. Approximately 0.9 acre of non-native riparian and 1.1 acres of wetlands would be permanently removed for project features.

Wildlife Commitments

Reclamation would:

- Ensure that construction contractors limit ground disturbance to the smallest feasible areas and that they implement BMPs along with the planting or reseeded of disturbed areas using native plant species to assist in the re-establishment of native vegetation as described under mitigation measures for vegetation resources in chapter V.
- To minimize disturbance to raptors, major construction activities along the Nutria and Defiance Monoclines, Cutter Canyon, Blanco Canyon, and the corridor from Cutter to Largo Canyons should be restricted during the nesting season (January 15 to August 15). If that is not possible, extensive nest searches should be made up to three-quarters of a mile of proposed activities immediately prior to construction and active nests avoided.

- Conduct extensive nest searches within one-quarter mile of proposed activities immediately prior to construction and avoid active nests if construction activities could not be scheduled outside the January 15 to July 15 timeframe.
- Incorporate raptor perch guards or raptor safe configurations on all new transmission structures.
- Avoid removal of riparian and wetland vegetation between March 15 and August 15 to avoid potential impacts to migratory bird nesting.
- Trench and bury pipeline concurrently to minimize trapping of small wildlife as possible. Reclamation would construct escape ramps for trenches left open overnight.

Aquatic Resources Commitments

The SJRBRIP would monitor and report total depletions in the Basin as described previously in the “Water Uses and Resources Commitments” section. The Navajo Nation would implement a Navajo Depletion Guarantee when needed to keep the Navajo Nation’s depletions within the Endangered Species Act depletion baseline. Reclamation would also incorporate BMPs, as previously described in the “Water Quality Commitments” section, to avoid or minimize project impacts to aquatic resources.

Special Status Species Commitments

Reclamation would:

- Implement conservation measures found in the final biological opinion on the proposed project (see appendix C, part III). These measures address the Colorado pikeminnow, razorback sucker, Southwestern willow flycatcher, and Mesa Verde cactus.
- Implement conservation measures for Navajo Nation listed species as described under “Special Status Species – Mitigation Measures” in chapter V.
- Conduct surveys for ferruginous hawk and bald eagle in proposed construction areas 1 year in advance of construction for pipeline routes and construction sites not adjacent to highways, well-traveled roads, or areas of regular human activity.

- Implement appropriate protective measures to avoid or minimize nest disturbance if active nests were found.
- Conduct surveys for Southwestern willow flycatcher in riparian and wetland habitat prior to construction within one-quarter mile of disturbed areas and avoid construction activities during the nesting season (March 15 to August 15) if active nesting is found.
- Delineate and avoid beautiful gila plants where possible.
- Refine the pipeline alignment to avoid individual Mesa Verde cactus and suitable habitat where possible.

Reasonable and prudent measures (RPMs) for Colorado pikeminnow and razorback sucker included in the final biological opinion are not included as environmental commitments. RPMs are measures to reduce incidental take of threatened or endangered species and are described as terms and conditions. The terms and conditions are nondiscretionary actions required by the action agency and are not included as mitigation measures.

Recreation Commitments

No environmental commitments are made for recreation resources.

Land Use Commitments

Reclamation would:

- Ensure that construction contractors limited ground disturbance to the smallest feasible area and that they implemented BMPs along with the planting or reseeded of disturbed areas to minimize impacts to existing land uses as previously described in the “Vegetation Commitments” section.
- Ensure that construction contractors fenced revegetated areas to prevent grazing activities until disturbed areas became re-established.
- Work with the Navajo Nation to provide temporary relocation assistance to affected livestock owners along the pipeline corridor.
- Provide relocation assistance to affected residences displaced by construction of the San Juan River water treatment facility.

Hazardous Materials Commitments

Reclamation would contact pipeline and gas well companies prior to construction activities to identify and avoid existing hazards. Pipeline alignments would be adjusted, as needed, to avoid impacts to pipelines and wells.

Soils Commitments

Reclamation would mandate that construction contractors use and implement measures contained in erosion control guidelines and BMPs to control soil erosion from construction areas as described under mitigation measures for soils in chapter V.

Geology Commitments

No environmental commitments are made for geologic resources.

Paleontologic Commitments

During construction activities, Reclamation would monitor areas with exposure of geological units or settings that indicated a high likelihood of yielding vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. In the event of discovery, Reclamation would evaluate the significance before construction could continue.

Reclamation would manage, on a case-by-case basis, construction activities adjacent to the Lynbrook and Betonnie Tsosie Fossil Areas. Reclamation would conduct paleontologic clearances prior to any surface-disturbing activities along the pipeline corridor in the Lynbrook and Betonnie Tsosie Fossil Areas.

Air Quality and Noise Commitments

Reclamation would require that construction contractors implement measures to control fugitive dust during construction as described under mitigation measures for air quality and noise in chapter V. No environmental commitments are made for noise abatement.

Socioeconomics Commitments

No environmental commitments are made for socioeconomic resources.

Environmental Justice Commitments

No environmental commitments are made for environmental justice.

Cultural Resources Commitments

Reclamation would:

- Implement a program to compensate for losses of archaeological sites that would occur as a result of construction and operation of the proposed project and the construction of conveyances as defined in the mitigation measures for cultural resources in chapter V.
- Coordinate the program with the New Mexico State Historic Preservation Officer, Navajo Nation Tribal Historic Preservation Officer, Bureau of Land Management, Bureau of Indian Affairs, city of Gallup, and the Advisory Council on Historic Preservation.
- Ensure compliance with mitigation measures developed in accordance with the Native American Graves Protection and Repatriation Act and Executive Order 13007 as described under “Cultural Resources – Mitigation Measures” in chapter V.



Chapter VII

CONSULTATION AND COORDINATION

Introduction
Public Involvement
Agency Consultation and Coordination
Other Consultation/Coordination Functions
Distribution List

INTRODUCTION

This chapter documents the consultation and coordination activities undertaken by the Bureau of Reclamation (Reclamation) during preparation of this planning report and final environmental impact statement (PR/FEIS) for the Navajo-Gallup Water Supply Project (proposed project).

PUBLIC INVOLVEMENT

Public involvement is a process for including interested and affected individuals, organizations, agencies, and government entities in an agency's decision process.

Scoping Process

The scoping process was initiated in early 2000 to receive public input on the scope of the proposed project, consistent with the National Environmental Policy Act (NEPA) and its implementing regulations.

Scoping Meetings

A Notice of Intent to prepare a planning report and draft environmental impact statement (PR/DEIS) on construction and operation of the proposed project appeared in the *Federal Register* on March 27, 2000. The notice announced that public scoping meetings were to

be held throughout the proposed project area. A news release announcing the scoping meetings was distributed to an extensive mailing list as well as to the local media.

Meeting locations and dates were as follows:

Crownpoint Chapter House, Crownpoint, New Mexico	April 25, 2000
Saint Michaels Chapter House, Saint Michaels, Arizona	April 26, 2000
University of New Mexico Campus, Gallup, New Mexico	April 27, 2000
Diné College, Shiprock, New Mexico	May 2, 2000
San Juan College, Farmington, New Mexico	May 3, 2000

Scoping Issues

Various issues were identified during the scoping process, which included:

- Support for the proposed project to supply municipal water to the Navajo Nation and the city of Gallup to provide a comfortable and healthy place to live, promote a sense of community, and provide for economic development.
- A Navajo water rights settlement is needed along with the proposed project.
- Good quality drinking water is as important as quantity of water.
- Support was expressed for the San Juan River diversion alternatives with pipelines paralleling Route 491 and U.S. Highway 550. These are corridors where growth is planned to occur.
- Impacts to the Jicarilla Apache Tribe Water Rights Settlement Act (Public Law 102-441) should be considered.
- Impacts to Colorado River Basins States' ability to use compact apportionments should be considered.
- There is a concern that the city of Gallup will get water and that areas of the Navajo Nation will not.
- There is a concern that the water will promote uranium development and processing, resulting in contamination, as has happened in the past.
- American Indian (Indian) and non-Indian communities need to work together to make this project happen.

- There is a concern that tying into the Navajo Indian Irrigation Project (NIIP) may impact the NIIP and may not provide a reliable municipal water supply.
- The Navajo chapters surrounding the city of Gallup need a domestic water supply.
- Water for agriculture is also needed, at least for gardens and livestock.
- There is a demand for water further west of Window Rock, Arizona.
- There was support for concurrent groundwater development to get water to people before surface water would be available.
- There is a need to have water piped to locations where people are, and will be, living.
- There is a concern about sharing pipeline rights-of-way with the highway; the highway could have priority in the future.

Public Review of the Planning Report and Draft Environmental Impact Statement

The PR/DEIS was filed with the Environmental Protection Agency (EPA), and the Notice of Availability of the PR/DEIS was published on March 30, 2007, in the *Federal Register*. Volumes I and II of the PR/DEIS were sent to government agencies, interest groups, and individuals on the distribution list.

In November 2007, several sections of the PR/DEIS were updated in a report entitled, *Cost and Economic Update to 2007 Prices of the Planning Report and Draft Environmental Impact Statement*. All entities on the mailing list were either sent the report or postcards notifying them of the report's availability.

Public Comments

The official 90-day public comment period was from March 30, 2007, to June 28, 2007. There were about 280 comments identified from letters and public hearings that were addressed for inclusion in this PR/FEIS and available in volume III. Of the nearly 280 comments identified, 98 were from Tribes and Tribal Nations (73 of those were Navajo Nation), 90 were State and local governments, 36 were power and water interests, 10 were other organizations, and 45 were individuals. Approximately 30 percent of the comments came from public hearings.

Public Hearings

Public hearings were held in the same five locations as the scoping meetings between May and June 2007 to provide an opportunity for public written and oral testimony about the PR/DEIS. Approximately 240 individuals, including agency representatives and cooperators, attended. More detailed information about the comments and Reclamation's responses can be found in volume III.

AGENCY CONSULTATION AND COORDINATION

Interagency/intergovernmental coordination and consultation constitute an essential part of the environmental impact statement (EIS) process. They provide a forum in which close working relationships are developed with agencies and organizations that are affected by or concerned about a proposed project. A key objective of a consultation and coordination program is to provide an opportunity for agencies and organizations to participate in the investigation of project alternatives and to provide input about specific project-related issues.

Coordination Activities

As the lead agency responsible for preparation of the PR/FEIS, Reclamation used an interdisciplinary team of Reclamation and consulting resource specialists to prepare the document, including the Navajo and Jicarilla Apache Nations and their staff and consultants. (A list of preparers is contained in the "List of Preparers" section). In addition, several other Federal, State, and local agencies participated with the interdisciplinary team during preparation of the PR/FEIS. Table VII-1 provides a list of those agencies with jurisdictional authority, interest, or expertise in the activities or issues associated with the proposed project.

Consultation Activities

U.S. Fish and Wildlife Service

Section 7 of the Endangered Species Act.—Reclamation and the U.S. Fish and Wildlife Service (Service) have consulted, both formally and informally, regarding potential impacts to special status species that may be affected as a result of the development and operation of the proposed project.

Table VII-1.—Agencies and organizations that participated in the project consultation and coordination process

Federal agencies
Bureau of Indian Affairs ¹
Bureau of Land Management
Bureau of Reclamation
Department of Energy, Western Area Power Administration
Environmental Protection Agency
Indian Health Service
U.S. Army Corps of Engineers
U.S. Department of the Interior
U.S. Fish and Wildlife Service
State of Colorado Water Conservation Board
New Mexico Department of Game and Fish
New Mexico Interstate Stream Commission ¹
Local governments
Northwest New Mexico Council of Governments ¹
City of Gallup ¹
Tribal governments
Hopi Tribe
Isleta Pueblo
Jicarilla Apache Nation ¹
Laguna Pueblo
Navajo Nation ¹
Pueblo of Zuni
Southern Ute Indian Tribe

¹ PR/EIS cooperating agencies.

A biological assessment was developed by Reclamation, and the Service issued a final biological opinion under the Endangered Species Act (ESA) dated February 26, 2009 (see volume II, appendix C, part III).

The final biological opinion incorporates a Navajo Nation Depletion Guarantee, which limits new depletion associated with the project to 5,271 acre-feet at full development (see chapter VI and volume II, appendix C). The biological opinion concludes that the 5,271 acre-feet of new depletions associated with the proposed project will not jeopardize the continued existence of the Colorado pikeminnow, razorback sucker, or Mesa Verde cactus or adversely modify their designated critical habitat. However, because larval fish may be lost due to the project diversions, the fish would be adversely affected. The biological opinion identifies reasonable and prudent measures to reduce incidental take of Colorado pikeminnow and razorback sucker and incorporates conservation measures to reduce the direct take of Mesa Verde cactus. The biological opinion also states that if

reinitiation is required, the Service will follow the procedures regarding reinitiation of consultation pursuant to the “Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin.”

Fish and Wildlife Coordination Act.—A Planning Aid Memorandum and Fish and Wildlife Coordination Act (FWCA) report have also been completed by the Service (volume II, appendix C). The FWCA report contains numerous recommendations that are described in the “Wildlife Commitments” section of chapter VI. The Service’s official recommendations will be contained in the final FWCA report, which will be included in this PR/FEIS.

To minimize project impacts to fish and wildlife resources, the FWCA recommends that Reclamation incorporate the mitigation measures described below. Reclamation’s preliminary responses to the FWCA recommendations follow each recommendation. Mitigation measures are discussed in greater detail in chapters V and VI.

FWCA Recommendation 1: Replace any woody vegetation (e.g., willows) unavoidably lost by establishing 2 acres of native vegetation for every acre impacted. If trees are removed, the Service recommends a minimum ratio of 10 saplings be planted for each mature tree lost. Planting of willows and cottonwood poles should be dense and in a location where adequate water is available to ensure that mitigation is successful. Mitigation should cover the direct removal of vegetation during construction as well as induced mortality that may occur in future years.

Reclamation’s Response 1: Reclamation would minimize impacts to wetland and riparian vegetation where possible. Reclamation would replace removed riparian and wetland habitat with creation of acre-per-acre replacement or the enhancement of 3 acres for each acre lost. On-site and adjacent mitigation sites would be considered before enhancing off-project sites. Reclamation would revegetate disturbed areas using native species and monitor plantings to ensure establishment of native cover equivalent to pre-construction levels.

FWCA Recommendation 2: Tree stands or vegetated areas slated for grubbing or clearing should be surveyed for the presence of nesting birds during the general migratory bird nesting season of March through August. Avoid disturbing nesting areas until nesting is complete.

Reclamation’s Response 2: Reclamation would survey previously undisturbed areas or suitable habitats for the presence/absence of nesting birds prior to implementing construction activities during the nesting season. If nesting birds are identified, construction activities would be modified to avoid disturbing nesting birds during the nesting season from March 15 to July 15.

FWCA Recommendation 3: Employ silt curtains, cofferdams, straw bales, or other suitable erosion control measures during construction.

Reclamation's Response 3: Best Management Practices are included to protect water quality and soils.

FWCA Recommendation 4: Monitor intake pump, sump, and settling ponds to estimate larval entrainment during periods of drift. Contact the Service to determine if further project review under the FWCA is appropriate if entrainment exceeds the estimates.

Reclamation's Response 4: Reclamation proposes that monitoring of larval entrainment be conducted as an activity of the San Juan River Basin Recovery Implementation Program (SJRBRIP). Reclamation would reconsult with the Service under section 7 of the ESA if incidental take of threatened and endangered species exceeded the limits identified in the Incidental Take Statement likely included in the biological opinion.

FWCA Recommendation 5: Dewater in-channel construction areas prior to construction. Maintain fish passage around dewatered construction areas during construction. Construct the proposed project during periods of low flow and low precipitation.

Reclamation's Response 5: All in-channel construction areas would be dewatered prior to construction. Fish passage around the dewatered construction areas would be maintained while the Public Service Company of New Mexico fish passage was in operation (April through October). In-channel construction activities would be limited to the period November through March.

FWCA Recommendation 6: Monitor water quality before, during, and after construction to ensure compliance with State water quality standards.

Reclamation's Response 6: Reclamation and its contractors would comply with all permit requirements issued under section 401 (State and Tribal Water Quality Certification), 402 (Dewatering) and 404 (Dredge and Fill) of the Clean Water Act.

FWCA Recommendation 7: Contain poured concrete in forms and/or behind cofferdams to prevent discharge into the river. Contain and treat or remove for off-site disposal any waste water from concrete-batching, vehicle wash-down, and aggregate processing.

Reclamation's Response 7: These recommendations are standard language included in Reclamation's construction contracts. Contractors are required to prepare and submit storm water and waste management plans for all construction-related activities.

FWCA Recommendation 8: Store and dispense fuels, lubricants, hydraulic fluids, and other petrochemicals outside the 100-year flood plain. Inspect construction equipment daily for petrochemical leaks. Contain and remove any petrochemical spills and dispose of these materials at an approved upland site. Park construction equipment outside the 100-year flood plain during periods of inactivity.

Reclamation's Response 8: These recommendations are also standard language included in Reclamation's construction contracts. Contractors are required to prepare and submit a Spill Prevention and Containment Plan for all construction-related activities.

FWCA Recommendation 9: Carry an oil kit or spill blanket at all times. Ensure equipment operators are knowledgeable in the use of spill containment equipment. Develop a spill contingency plan prior to initiation of construction. Immediately notify the proper Federal and State authorities in the event of a spill.

Reclamation's Response 9: See Reclamation's Response 8 above.

FWCA Recommendation 10: Use only clean cobble and quarry stone from an upland source. Use uncontaminated earth or alluvium suitable for revegetation with indigenous plant species for backfill. Revegetate or reseed backfill and other disturbed areas with native plants or seeds to accelerate revegetation with native species.

Reclamation's Response 10: Reclamation would use only suitable uncontaminated material during construction. All disturbed areas would be revegetated with native plant species. Where feasible during pipeline and other project feature construction, top soils would be stockpiled and used in revegetation efforts.

FWCA Recommendation 11: Where possible, minimize trapping of wildlife during pipeline installation by trenching and burying pipeline concurrently. Leave the least amount of trench open overnight and provide escape ramps for trapped wildlife.

Reclamation's Response 11: Reclamation would minimize trapping of wildlife during pipeline installation by trenching and burying pipeline concurrently and leaving the least amount of trench open overnight as possible. Escape ramps would be provided for trapped wildlife.

FWCA Recommendation 12: Revegetate all upland areas disturbed during construction, using native plants and seeds. For those upland areas where soils have become compacted as a result of heavy equipment operation, soils should be scarified or additional topsoil placed prior to revegetation.

Reclamation's Response 12: Reclamation would return all disturbed areas as nearly as possible to previous conditions. Topsoil removed during construction would be stockpiled for revegetation efforts and native plants and seeds would be used. If soils were compacted, the areas would be scarified prior to planting.

FWCA Recommendation 13: Minimize electrocution risk to raptors by installing perch guards or raptor-safe configurations on all transmission structures. Minimize collision risks to raptors and other bird species by marking transmission lines that pose a high collision risk with spiral vibration dampers or bird flight diverters.

Reclamation's Response 13: Raptor perch guards or raptor-safe configurations would be incorporated on all new transmission structures.

Environmental Protection Agency/U.S. Army Corps of Engineers

Reclamation would coordinate with the EPA and U.S. Army Corps of Engineers regarding potential project effects on wetlands and water quality.

Cultural Resources

Consultation/coordination occurred in two phases: (1) the Overview phase in 1992–93 and (2) the Alternatives Evaluation phase from 2000 through the present. During each phase, various parties were contacted to gather information and/or solicit their concerns about impacts and procedures to address those impacts.

Overview Phase:

Advisory Council on Historic Preservation
Bureau of Land Management, Farmington, New Mexico
Hopi Tribe
Jicarilla Apache Nation
Navajo Nation Historic Preservation Department
New Mexico Laboratory of Anthropology
New Mexico Office of Cultural Affairs, Historic Preservation Division
New Mexico State Land Office
Pueblo of Acoma
Pueblo of Zuni
Southern Ute Indian Tribe
The All-Indian Pueblo Council
Ute Mountain Ute Tribe

Alternatives Evaluation Phase:

Bureau of Indian Affairs (BIA), Navajo Region (by copy)
Bureau of Land Management, Farmington, New Mexico
Burnham Chapter
City of Gallup, New Mexico

Counselor Chapter
Coyote Canyon Chapter
Hopi Tribe
Huerfano Chapter
Jemez Pueblo
Jicarilla Apache Nation
Nageezi Chapter
Nahodishgish Chapter
Nambe Pueblo
Naschitti Community Chapter
Navajo Nation Historic Preservation Department
Navajo Nation Water Resources Department
Nenahnezad Chapter
New Mexico Office of Cultural Affairs, Historic Preservation Division
Newcomb Chapter
Ojo Encino Chapter
Pojoaque Pueblo
Pueblo of Acoma
Pueblo of Laguna
Pueblo of Zuni
Pueblo Pintado Chapter
Rock Springs Chapter
San Felipe Pueblo
San Idelfonso Pueblo
San Juan Chapter
San Juan Pueblo
Sandia Pueblo
Sanostee Chapter
Santa Ana Pueblo
Santa Clara Pueblo
Santo Domingo Pueblo
Sheep Springs Chapter
Shiprock Chapter
Southern Ute Indian Tribe
Standing Rock Chapter
Taos Pueblo
Tesuque Pueblo
Tohatchi Chapter
Torreon Chapter
Tsayatoh Chapter
Twin Lakes Chapter
Two Grey Hills Chapter

Ute Mountain Ute Tribe
Whiterock Chapter
Zia Pueblo

Most of the contacts were made via correspondence. Meetings were convened and phone calls were made. As a result of these contacts, studies were undertaken, and from consultations with the Navajo Nation Historic Preservation Department in particular, the general impacts have been determined. An approach to addressing impacts was developed, as described in chapter VI.

Navajo-Gallup Steering Committee

A project steering committee has been established and functioning since the early 1990s. The committee's purpose is to oversee and guide the planning and implementation of the proposed project. The committee is composed of representatives from the Navajo and Jicarilla Apache Nations, State of New Mexico, Northwest New Mexico Council of Governments, city of Gallup, Navajo Tribal Utility Authority, BIA, Indian Health Service, and Reclamation. Since 2000, the committee has met approximately four times a year to discuss planning status, address issues, and make assignments. The assignments are carried out by the various entities represented by the committee and interagency teams. For purposes of EIS preparation, the steering committee members also serve as the cooperating agencies for implementation of NEPA. Cooperating agencies are Federal agencies and local, State, and Tribal governments with appropriate expertise or jurisdiction.

The Upper Colorado River Commission

The Upper Colorado River Commission (Commission) has been engaged in project water supply issues. The Commission passed a resolution in June 2003 supporting the proposed project and consenting to a diversion of water from the Upper Basin for use in the Lower Basin within New Mexico (attachment E). The Commission also passed a resolution in June 2006 supporting a proposed hydrologic determination by the Secretary of the Interior (Secretary) that sufficient water is reasonably likely to be available to fulfill the proposed project needs in New Mexico from the Navajo Reservoir water supply (attachment E). This water is in addition to existing Navajo Reservoir water supply contract water for other uses under the allocations made to New Mexico in Articles III and XIV of the Upper Colorado River Basin Compact. The hydrologic determination prepared by Reclamation was signed by the Secretary on June 8, 2007 (attachment N).

The Arizona Department of Water Resources

The Arizona Department of Water Resources (ADWR) has been involved with the proposed project's Arizona water supply. Discussions among Reclamation, the Navajo Nation, and the ADWR have been ongoing since 2003.

San Juan River Basin Recovery Implementation Program

Project planning has been discussed with the SJRBRIP Biology, Hydrology, and Coordinating Committees with presentations and discussions since 2002.

OTHER CONSULTATION/COORDINATION FUNCTIONS

In April 1998, George Galanis, the Mayor of the city of Gallup, and Thomas Atcitty, President of the Navajo Nation, signed an agreement to cooperate on the planning for the proposed project. That document commits the city and the Navajo Nation to:

- A cooperative effort to proceed with planning and development
- A project that works conjunctively with the NIIP
- A project that will result in a fair and equitable distribution of project water between the city of Gallup and the Navajo communities
- Cooperatively investigate all viable alternative project configurations
- Support the commitment of BIA to engage in consultation with the Service as quickly as possible
- Work together to resolve issues affecting the implementation of the proposed project

The Memorandum of Agreement continues to serve as the basis for the collaborative efforts of the Navajo Nation and the city of Gallup to develop the proposed project (attachment A).

DISTRIBUTION LIST¹

Congressional delegations	
U.S. and State Representatives	City, State
Mark Udall U.S. Senator of Colorado	Washington, D.C.
Jeff Bingaman U.S. Senator of New Mexico	Washington D.C.
Ray Begaye New Mexico State Representative	Shiprock, New Mexico
Tom Udall U.S. Senator of New Mexico	Washington D.C.
Jane Poudreil-Culbert New Mexico State Representative	Corrales, New Mexico
Jon Kyl U.S. Senator of Arizona	Washington D.C.
Linda Lovejoy New Mexico State Senator	Crownpoint, New Mexico
W. Ken Martinez New Mexico State Representative	Crownpoint, New Mexico
John McCain U.S. Senator of Arizona	Washington D.C.
Harry Teague U.S. Representative of New Mexico	Washington D.C.
Anne Kirkpatrick U.S. Representative of Arizona	Washington D.C.
John T. Salazar U.S. Representative of Colorado	Washington, D.C.
Michael Bennett U. S. Senator of Colorado	Washington, D.C.

¹ This distribution list varies from the one in the PR/DEIS because some individuals or organizations requested to be removed, others added, and some elected officials have changed.

Congressional delegations (continued)

U.S. and State Representatives	City, State
Thomas C. Taylor New Mexico State Representative	Farmington, New Mexico
Paul Bandy New Mexico State Representative	Aztec, New Mexico
Ben Lujan U.S. Representative of New Mexico	Washington D.C.
Martin Heinrich U.S. Representative of New Mexico	Washington, D.C.
Businesses or agencies	City, State
House Appropriations Committee	Washington, D.C.
House Energy and Water Development	Washington, D.C.
House Resources Committee	Washington, D.C.
House Water and Power Subcommittee	Washington, D.C.
Senate Appropriations Committee	Washington, D.C.
Senate Energy and Natural Resources Committee	Washington, D.C.
Senate Indian Affairs Committee	Washington, D.C.
Senate Water and Power Subcommittee	Washington, D.C.
Federal Government agencies	
Advisory Council on Historic Preservation	Lakewood, Colorado Washington, D.C.
BLM/FS Public Land Center	Durango, Colorado
Bureau of Indian Affairs	Albuquerque, New Mexico Chinle, Arizona Dulce, New Mexico Española, New Mexico Farmington, New Mexico Gallup, New Mexico Ignacio, Colorado Shiprock, New Mexico Towaoc, Colorado Zia Pueblo, New Mexico

Federal Government agencies (continued)

Businesses or agencies	City, State
Bureau of Land Management	Albuquerque, New Mexico Bluff, Utah Durango, Colorado Farmington, New Mexico Lakewood, Colorado Moab, Utah Montecillo, Utah
Bureau of Reclamation	Albuquerque, New Mexico Boulder City, Nevada Denver, Colorado Durango, Colorado Farmington, New Mexico Grand Junction, Colorado Phoenix, Arizona Salt Lake City, Utah Washington, D.C.
Department of the Interior Office of the Field Solicitor Office of the Regional Solicitor – Southwest Region	Salt Lake City, Utah Albuquerque, New Mexico
Department of Justice Environment and Natural Resources Division Natural Resources Division/Policy Section	Washington, D.C.
Environmental Protection Agency	Dallas, Texas Denver, Colorado San Francisco, California Washington, D.C.
Federal Energy Regulatory Commission	San Francisco, California Washington, D.C.
Indian Health Service	Gallup, New Mexico Window Rock, Arizona
International Boundary and Water Commission	El Paso, TX
National Park Service	Denver, Colorado Mesa Verde, Colorado Santa Fe, New Mexico
Natural Resource Conservation Service	Durango, Colorado
Office of Emergency Management	Golden, Colorado
U.S. Army Corps of Engineers	Durango, Colorado Sacramento, California Washington, D.C.

Federal Government agencies (continued)

Businesses or agencies	City, State
U.S. Fish and Wildlife Service	Albuquerque, New Mexico Denver, Colorado Grand Junction, Colorado Lakewood, Colorado
U.S. Geological Survey	Albuquerque, New Mexico
Western Area Power Administration	Salt Lake City, Utah

Tribal governments

Hopi Tribe	Kykotsmovi, Arizona
Jicarilla Apache Nation	Dulce, New Mexico

Navajo Nation

Beclabito Chapter	Shiprock, New Mexico
Casamero Lake Chapter	Prewitt, New Mexico
Crownpoint Chapter	Crownpoint, New Mexico
DSFC OEHE NAIHS	Window Rock, Arizona
Navajo Agricultural Products Industry	Farmington, New Mexico
Navajo Nation Council	Gallup, New Mexico Mentmore, New Mexico Window Rock, Arizona
Navajo Nation Department of Fish and Wildlife	Window Rock, Arizona
Navajo Nation Department of Justice	Window Rock, Arizona
Navajo Nation Department of Water Resources	Fort Defiance, Arizona
Navajo Nation Environmental Protection Agency	Window Rock, Arizona
Navajo Nation Historic Preservation Department	Window Rock, Arizona
Nenahnezad Chapter	Fruitland, New Mexico
NNEPA/PWSSP	Window Rock, Arizona
NTUA	Fort Defiance, Arizona
Office of the President of the Navajo Nation	Window Rock, Arizona
San Juan Chapter	Fruitland, New Mexico
San Juan Diné Water Users Association	Shiprock, New Mexico
Shiprock Chapter	Shiprock, New Mexico
Shiprock Planning Commission	Shiprock, New Mexico
Upper Fruitland Chapter	Fruitland, New Mexico

Tribal governments (continued)	
Businesses or agencies	City, State
<i>Pueblo Indian Tribes</i>	
Pueblo of Acoma	Acoma, New Mexico
Pueblo of Cochiti	Cochiti Pueblo, New Mexico
Pueblo of Isleta	Isleta Pueblo, New Mexico
Pueblo of Jemez	Jemez Pueblo, New Mexico
Pueblo of Laguna	Laguna Pueblo, New Mexico
Pueblo of Nambe	Santa Fe, New Mexico
Pueblo of Ohkay Owingeh	San Juan Pueblo, New Mexico
Pueblo of Picuris	Penasco, New Mexico
Pueblo of Pojoaque	Santa Fe, New Mexico
Pueblo of San Felipe	San Felipe Pueblo, New Mexico
Pueblo of San Ildefonso	Santa Fe, New Mexico
Pueblo of Sandia	Bernalillo, New Mexico
Pueblo of Santa Ana	Bernalillo, New Mexico
Pueblo of Santa Clara	Española, New Mexico
Pueblo of Santo Domingo	Santo Domingo Pueblo, New Mexico
Pueblo of Taos	Taos, New Mexico
Pueblo of Tesuque	Santa Fe, New Mexico
Pueblo of Zia	Zia Pueblo, New Mexico
Pueblo of Zuni	Zuni, New Mexico
San Juan Southern Paiute Tribe	Tuba City, Arizona
Southern Ute Indian Tribe	Durango, Colorado Ignacio, Colorado
<i>Ute Mountain Ute Tribe</i>	
Ute Mountain Ute Tribe	Boulder, Colorado Towaoc, Colorado
Weeminche Construction Authority	Towaoc, Colorado

State government agencies	
Colorado Attorney General	Denver, Colorado
Colorado Department of Agriculture	Lakewood, Colorado
Colorado Department of Education, Office of Archaeology and Historic Preservation	Denver, Colorado
Colorado Department of Health	Denver, Colorado
Colorado Department of Natural Resources	Denver, Colorado
Colorado Division of Water Resources	Durango, Colorado
Colorado Division of Wildlife	Denver, Colorado Durango, Colorado
Colorado Local Affairs Department	Denver, Colorado
Colorado Office of the Governor	Denver, Colorado
Colorado State Parks	Arboles, Colorado Clifton, Colorado Denver, Colorado
Colorado Water Conservation Board	Denver, Colorado
Navajo Lake State Park	Aztec, New Mexico
New Mexico Department of Game and Fish	Navajo Dam, New Mexico Santa Fe, New Mexico
New Mexico DOH/McKinley County Health Office	Gallup, New Mexico
New Mexico Energy Minerals & Natural Res. Dept.	Santa Fe, New Mexico
New Mexico Environment Department	Santa Fe, New Mexico
New Mexico Historic Preservation Division	Santa Fe, New Mexico
New Mexico Interstate Stream Commission	Santa Fe, New Mexico
New Mexico Office of the State Engineer	Aztec, New Mexico Denver, Colorado
New Mexico State Land Office	Santa Fe, New Mexico
New Mexico State Parks	Navajo Dam, New Mexico
Northwest New Mexico Council of Governments	Gallup, New Mexico
State of Colorado	Denver, Colorado
State of New Mexico, Office of the Governor	Santa Fe, New Mexico
Upper Colorado River Commission	Salt Lake City, Utah
Utah Department of Natural Resources	Salt Lake City, Utah
Utah Division of Wildlife	Salt Lake City, Utah

City government agencies	
City of Aztec	Aztec, New Mexico
City of Bloomfield	Bloomfield, New Mexico
City of Cortez	Cortez, Colorado
City of Durango	Durango, Colorado
City of Farmington	Farmington, New Mexico
City of Gallup	Gallup, New Mexico
City of Gallup/GJU	Gallup, New Mexico
Town of Bayfield	Bayfield, Colorado
Town of Ignacio	Ignacio, Colorado
Town of Kirtland	Kirtland, New Mexico
County government agencies	
La Plata County Commissioners	Durango, Colorado
McKinley County	Gallup, New Mexico
Montezuma County Commissioners	Cortez, Colorado
San Juan County	Aztec, New Mexico
Local government agencies	
Colorado Water Congress	Denver, Colorado
Water users	
Animas-La Plata Water Conservancy District	Durango, Colorado
Blanco Water Users Association	Blanco, New Mexico
Bloomfield Irrigation District	Bloomfield, New Mexico
Bloomfield Irrigation Ditch Company	Blanco, New Mexico
Colorado River Water Conservation District	Glenwood Springs, Colorado
Dolores Water Conservancy District	Cortez, Colorado
Florida Farmers and Florida Cooperative Ditches	Durango, Colorado
Florida Water Conservancy District	Durango, Colorado
Hammond Conservancy District	Bloomfield, New Mexico
Hammond Water Conservancy District	Bloomfield, New Mexico
La Plata Conservancy District	La Plata, New Mexico
La Plata Water Conservancy District	Hesperus, Colorado
Lower Valley Water Users	Kirtland, New Mexico
Mancos Water Conservancy District	Mancos, Colorado
Navajo Dam Water Users Association	Navajo Dam, New Mexico

Water users (continued)	
Businesses or agencies	City, State
Pine River Irrigation District	Bayfield, Colorado
San Juan River Dineh Water Users, Inc.	Shiprock, New Mexico
San Juan Water Commission	Farmington, New Mexico
Southwestern Water Conservation District	Durango, Colorado
Turley Ditch Company	Blanco, New Mexico
Turley-Manzanaras Ditch	Blanco, New Mexico
Upper La Plata Water Users Association	La Plata, New Mexico
West Hammond Water Users Association	Bloomfield, New Mexico
Utility companies	
Arizona Public Service	Fruitland, New Mexico
Colorado River Energy Distributors Association	Tempe, Arizona
Colorado Water Resources and Power	Denver, Colorado
Farmington Electric Utility System	Farmington, New Mexico
Public Service Company of New Mexico	Waterflow, New Mexico
Mineral companies	
BHP Minerals	Farmington, New Mexico
Bloomfield Refining Company	Bloomfield, New Mexico
Recreation/Tourism	
American Fisheries Society	Bethesda, Maryland
Artemis Wilderness Tours	El Prado, New Mexico
B-Square Ranch	Farmington, New Mexico
Born-n-Raised on the San Juan River, Inc.	Navajo Dam, New Mexico
Duranglers	Durango, Colorado Navajo Dam, New Mexico
Four Corners River Sports	Durango, Colorado
Guide Service	Navajo Dam, New Mexico
Mountain Waters Rafting	Durango, Colorado
Navajo Dam Enterprises – Marina	Navajo Dam, New Mexico
New Mexico Trout	Albuquerque, New Mexico
Outlaw River & Jeep Tours	Durango, Colorado
Recapture Lodge	Bluff, Utah

Recreation/Tourism (continued)

Businesses or agencies	City, State
Rizutos Fly Shop	Navajo Dam, New Mexico
San Juan Flyfishing Federation	Farmington, New Mexico
San Juan Shrine Club	Farmington, New Mexico
Sportsman Inn	Navajo Dam, New Mexico
Trout Unlimited	Arlington, Virginia
Wild Rivers Expeditions	Bluff, Utah

Environmental groups

Cedar Hill Clean Water Coalition	Aztec, New Mexico
Citizens Progressive Alliance	Littleton, Colorado
Clean Water Action	Denver, Colorado
Colorado River Alliance	Durango, Colorado
Earth Justice Legal Defense Fund	Denver, Colorado Washington, D.C.
Electors Concerned about Animas Water	Farmington, New Mexico
Environmental Defense Fund	New York, New York
Four Corners Action Coalition	Aztec, New Mexico
Glen Canyon Action Network	Moab, Utah
HCCA/Sierra Club	Crested Butte, Colorado
National Wildlife Federation	Washington, D.C.
San Juan Audubon Society	Durango, Colorado
Sierra Club	Boulder, Colorado San Francisco, California
Taxpayers for the Animas River	Durango, Colorado Mancos, Colorado
The Nature Conservancy	Arlington, Virginia
The Wildlife Society	Bethesda, Maryland

Media

Albuquerque Journal	Albuquerque, New Mexico
Albuquerque Tribune	Albuquerque, New Mexico
Associated Press	Albuquerque, New Mexico
Four Corners Broadcasting	Durango, Colorado

Media (continued)

Businesses or agencies	City, State
Four Corners Flyer	Farmington, New Mexico
Gallup Independent	Gallup, New Mexico
Grand Junction Sentinel	Grand Junction, Colorado
KDGO – KISZ Radio	Durango, Colorado
KENN/KRWN Radio	Farmington, New Mexico
KKFG Radio Station	Farmington, New Mexico
KLLV Radio	Hesperus, Colorado
KOAT ABC Action 7 News	Albuquerque, New Mexico
KOAT TV	Farmington, New Mexico
KOBF – TV	Farmington, New Mexico
KREZ – TV	Durango, Colorado
KSJE Radio	Farmington, New Mexico
KSUT Radio	Ignacio, Colorado
KTNN Radio	Window Rock, Arizona
KTRA FM	Farmington, New Mexico
KWYK-KNDN Radio Station	Farmington, New Mexico
Pagosa Springs Sun	Pagosa Springs, Colorado
Pine River Times	Bayfield, Colorado
The Cortez Journal	Cortez, Colorado
The Daily Times	Farmington, New Mexico
The Durango Herald	Durango, Colorado
The Durango Telegraph	Durango, Colorado
The Navajo Times	Window Rock, Arizona
The New Mexican	Santa Fe, New Mexico
The Southern Ute Drum	Ignacio, Colorado
Times Independent	Moab, Utah

Libraries

Albuquerque Public Library	Albuquerque, New Mexico
Alturian Public Library	Aztec, New Mexico
Aztec Public Library	Aztec, New Mexico
Bloomfield City Library	Bloomfield, New Mexico

Libraries (continued)

Colorado School of Mines Library	Golden, Colorado
Colorado State University	Fort Collins, Colorado
Cortez Public Library	Cortez, Colorado
Denver Public Library	Denver, Colorado
Diné College	Shiprock, New Mexico
Durango High School Library	Durango, Colorado
Durango Public Library	Durango, Colorado
Farmington Public Library	Farmington, New Mexico
Fort Lewis College Library	Durango, Colorado
Navajo Nation Library	Window Rock, Arizona
New Mexico State Library	Santa Fe, New Mexico
New Mexico State University Library	Las Cruces, New Mexico
San Juan College Library	Farmington, New Mexico
University of Colorado Libraries	Boulder, Colorado
University of Denver Library	Denver, Colorado
University of New Mexico	Albuquerque, New Mexico
University of Northern Colorado	Greeley, Colorado

Schools and colleges

Crownpoint Institute of Technology	Gallup, New Mexico
Diné College	Shiprock, New Mexico
Fort Lewis College	Durango, Colorado
New Mexico State University	Las Cruces, New Mexico
Northern Arizona University	Flagstaff, Arizona
San Juan College	Farmington, New Mexico
Southwest Open High School	Cortez, Colorado
University of New Mexico, Department of Biology	Albuquerque, New Mexico
University of Northern Colorado	Greeley, Colorado

Legal

Herb Becker	Albuquerque, New Mexico
Greene, Meyer & McElroy PC	Boulder, Colorado
Dan Israel	Boulder, Colorado

Legal (continued)

Maynes, Bradford, Shipp & Sheftel	Durango, Colorado
Nordhaus Law Firm	Albuquerque, New Mexico Santa Fe, New Mexico

Consultants

Architectural Research Consultants	Albuquerque, New Mexico
Ayes Associates	Fort Collins, Colorado
Bio/West, Inc.	Logan, Utah
Canyonlands Field Institute	Moab, Utah
Dornbusch & Company, Inc.	Berkeley, California
Ecosystems Research Institute	Logan, Utah
EMI, Inc.	Durango, Colorado
Gold H ₂ O Pro, Inc.	Salt Lake City, Utah
HabiTech, Inc.	Laramie, Wyoming
Harris Water Engineering, Inc.	Durango, Colorado
Hill & Robbins PC	Denver, Colorado
Hydrosphere Resource Consultants	Boulder, Colorado
Keller-Bliesner Engineering	Logan, Utah
Mactec – ERS	Grand Junction, Colorado
Miller Ecological Consultants, Inc.	Fort Collins, Colorado
Modrall, Sperling, Roehl, Harris & Sisk	Albuquerque, New Mexico
Parson Engineering Science	South Jordan, Utah
Pinnacle West Capital Corp	Phoenix, Arizona
Water Consult	Loveland, Colorado
William J. Miller Engineers, Inc.	Santa Fe, New Mexico

Individuals

Name	City, State
Debbie Abbott	Farmington, New Mexico
Robert Ahkeah	Shiprock, New Mexico
Elisa Arviso	Window Rock, Arizona
Lloyd D. Ayliffe	Broomfield, New Mexico
Robert Baker	Hesperus, Colorado
Cliff Barrett	Perry, Utah
Kaibah Begay	Shiprock, New Mexico

Individuals (continued)

Ernest Beleen	Fruitland, New Mexico
Mark Belles	Rowlett, Texas
Herb Beyale Jr.	Shiprock, New Mexico
David Biser	Kirtland, New Mexico
Clayton Bond	Kirtland, New Mexico
Larry Bonney	Shiprock, New Mexico
Dick Brown	Albuquerque, New Mexico
Bob Browning	Farmington, New Mexico
Ralph E. Clark III	Gunnison, Colorado
Mark Condiotti	Durango, Colorado
Cathrine Condon	Boulder, Colorado
Margie Connolly	Dolores, Colorado
Cy Cooper	Farmington, New Mexico
Deborah Cozens	Tempe, Arizona
Dale Diamond	Fallbrook, California
Leslie Dimmick	Farmington, New Mexico
Kevin Doyle	Santa Fe, New Mexico
Doug Echols	Farmington, New Mexico
Steve Ellison	Farmington, New Mexico
Pat Flavian	Farmington, New Mexico
Kent Ford	Durango, Colorado
Maxwell C. Freudenberg	Durango, Colorado
Raymond Fulton	Waterflow, New Mexico
Perry Garnenez	Shiprock, New Mexico
Prestene Garnenez	Fort Defiance, Arizona
Dorinda Gaston	Bloomfield, New Mexico
John Geddie	Albuquerque, New Mexico
Jana Gunnell	Gallup, New Mexico
Chris Harbin	Louisville, Kentucky
Daniel B. Harper	Durango, Colorado
Gary Horner	Farmington, New Mexico
Sandra Hunt	Waterflow, New Mexico
Lula Jackson	Shiprock, New Mexico

Individuals (continued)

Name	City, State
Sammie Jim	Crownpoint, New Mexico
Martin L. Johnson	Farmington, New Mexico
Rick Johnson	Flagstaff, Arizona
Lolly Jully	Shiprock, New Mexico
Neal Kelemen	Denver, Colorado
Tom Kilmartin	Lombard, Illinois
Steve Krest	Marvel, Colorado
Tony Lee	Fruitland, New Mexico
Anita Mayes	Shiprock, New Mexico
Danny Milo	Albuquerque, New Mexico
Dan Neifert	Farmington, New Mexico
Ron Nott	Farmington, New Mexico
Michael H. Paine	Farmington, New Mexico
Kathleene Parker	White Rock, New Mexico
Lee Norberto	Naqeeeri, New Mexico
Evert Oldham	Flora Vista, New Mexico
Adelaide Paiz	Dulce, New Mexico
Janet Parkes	Farmington, New Mexico
Melia Pope	Brighton, Colorado
Lori Potter	Denver, Colorado
Tracy Raymond	Shiprock, New Mexico
Janet Reed	Bloomfield, New Mexico
Katherine Roxlau	Albuquerque, New Mexico
Ken Rustad	Farmington, New Mexico
Bill & Janice Schnorr	Farmington, New Mexico
James Spence	Farmington, New Mexico
Paul Stavely	Farmington, New Mexico
Travis Stills	Durango, Colorado
Michael D. Sullivan	Farmington, New Mexico
Jerry A. Swingle	Durango, Colorado
Bill Utton	Aztec, New Mexico

Individuals (continued)

Name	City, State
Orion J. Utton	Aztec, New Mexico
Louise Voelker	Durango, Colorado
Renee Wilhelm	Ignacio, Colorado
Sandy Williams	Flora Vista, New Mexico



Chapter VIII

PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

Introduction
Endangered Species Act
Clean Water Act
Cultural Resource Laws and Policies
Other Regulatory Requirements

INTRODUCTION

This planning report and final environmental impact statement is intended to provide decisionmakers and the public with information regarding the environmental effects of the construction, operation, and maintenance of the proposed Navajo-Gallup Water Supply Project (proposed project), as part of the Bureau of Reclamation's (Reclamation) compliance with the National Environmental Policy Act (NEPA). In addition to NEPA compliance, a number of permits must also be obtained and/or complied with in order to implement the proposed project.

This chapter discusses the permits, approvals, and regulatory requirements that would be necessary for the construction, operation, and maintenance of the San Juan River Public Service Company of New Mexico (SJRPNM) Alternative. When future water uses (i.e., residential and commercial developments on Tribal lands) are implemented, NEPA compliance and similar regulatory requirements would have to be met as well; however, the specific regulatory requirements would vary depending on the developments proposed. These requirements are not detailed in this chapter.

Reclamation is required to ensure compliance with the Endangered Species Act (ESA), Clean Water Act (CWA), National Historic Preservation Act (NHPA) of 1966, Migratory Bird Treaty Act, Fish and Wildlife Coordination Act (FWCA), and Bald Eagle Protection Act. At the Federal level, required permits and approval authority outside of Reclamation's jurisdiction also include compliance with the Clean Air Act (CAA). Each of these statutes has been taken into account in the preparation of this document. The State of New Mexico and the Navajo Nation may require additional State-Tribal review.

ENDANGERED SPECIES ACT

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any Federal agency should not “. . .jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined. . .to be critical. . .” [16 USC 1536 9(a)(2)(1998)]. Reclamation is required to consult with the U.S. Fish and Wildlife Service (Service) to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed project. If, upon review of the existing data, Reclamation determines that these species or habitats may be affected by the proposed action, Reclamation is required to prepare a biological assessment to identify the nature and extent of adverse impacts and to recommend mitigation measures that would avoid the habitat and/or species or that would reduce potential impact to acceptable levels. If, however, Reclamation determines that no federally listed or proposed endangered or threatened species or their designated critical habitat would be affected by the proposed project, no further action is necessary.

Consultation was initiated on the proposed project during the early planning stages. Formal consultation was initiated with the submission of a final biological assessment from Reclamation to the Service on August 22, 2005. Formal consultation was completed on February 26, 2009, with the Service’s issuance of a final biological opinion. The opinion is included as part III of appendix C in volume II.

CLEAN WATER ACT

Reclamation would submit applications to the U.S. Army Corps of Engineers under section 404 of the CWA for activities involving the discharge of dredge or fill material into waters of the United States. Where possible, Reclamation would request authorization under existing Nationwide or Regional General Permits. In the event that an individual 404 permit application is necessary, Reclamation would also request CWA section 401 (Water Quality Certification) from the State of New Mexico and the Navajo Nation Environmental Protection Agency. Section 404 permit conditions, including compensatory wetland mitigation requirements, would be incorporated as environmental commitments. Permit requirements normally include Best Management Practices to minimize and avoid impacts to water quality, wetlands, and special aquatic sites.

CULTURAL RESOURCE LAWS AND POLICIES

The NHPA, as amended, requires Federal agencies to identify cultural resources within areas of proposed Federal undertakings to assess the eligibility of such resources for

inclusion in the *National Register of Historic Places (National Register)* and to take steps to mitigate potentially adverse effects to cultural resource sites. Section 106 of the NHPA requires Reclamation to take into account the effects of its undertakings on properties listed on, or eligible for listing on, the *National Register*, including prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking.

The criteria used to evaluate the cultural resource sites that might be affected by construction of the proposed project follow guidelines set forth by NHPA regulations for determining eligibility to the *National Register*. The process for determining the eligibility of a property must be evaluated referencing the *National Register* Criteria for Evaluation (36 CRF Part 60) in order to determine the property's eligibility to the *National Register*. The criteria are as follows:

- (1) Association with events that have made a significant contribution to the broad pattern of our history
- (2) Association with the lives of persons significant in our past
- (3) Embodiment of the distinctive characteristics of a type, period, or method of construction, or representing the work of a master, or possessing high artistic values, or representing a significant and distinguishable entity whose components may lack individual distinction
- (4) Having yielded, or having the likelihood to yield, information important in prehistory or history

All negative impacts, whether direct or indirect, to cultural resource sites that are eligible or recommended eligible or potentially eligible for inclusion on the *National Register* would be considered significant.

In accordance with ACHP procedures, Reclamation, as the lead agency, is required to consult with the appropriate State Historic Preservation Officers (SHPO), Tribal Historic Preservation Officers (THPO), affected American Indian (Indian) Tribes/Tribal Nations, and other governmental entities on the potential effects of the undertaking on *National Register* listed or eligible cultural resources.

Another applicable law and policy includes the Navajo Nation Cultural Protection Act for Tribal lands. This includes following Navajo Nation policies concerning the protection of archaeological sites and traditional cultural properties and guidelines for the treatment of historic, modern, and contemporary abandoned and in-use sites.

In and around the city of Gallup, and on other privately held lands affected by the proposed project, certain provisions of the New Mexico Cultural Properties Act apply.

Preceding implementation of the proposed project, a programmatic agreement would be formulated with the ACHP, the New Mexico SHPO, the Bureau of Land Management, the Bureau of Indian Affairs, the city of Gallup, and the Navajo THPO. A programmatic agreement similar to the one developed for the Animas-La Plata Project would be signed by all parties prior to implementation of the proposed project. This programmatic agreement would set forth the procedures that must be followed in order to ensure compliance with cultural resource laws and policies.

The programmatic agreement would stipulate the procedures for development, review, and implementation of mitigation plans. It would describe measures to minimize and avoid impacts to cultural resources, such as in-place preservation, monitoring, distribution of information, and public and Native American involvement. If cultural resource sites could not be avoided and protected in-place, a program to compensate for losses to sites as a result of project construction would be needed. This program would include archaeological excavations and publications and reports detailing the findings of those excavations. All work would meet Archaeological Resource Protection Act Permit requirements and the permit requirements of other applicable jurisdictions.

Under the Native American Graves Protection and Repatriation Act (NAGPRA), the Navajo Nation Policy for the Protection of Jishchaa', and State burial laws, Federal agencies must consult with potentially affected Tribal Nations and/or State agencies, depending on land status, concerning the appropriate treatment and disposition of any gravesites or human remains and cultural items that may be encountered on the proposed project. Pursuant to these laws and policies, a NAGPRA Plan would be formulated prior to project construction.

OTHER REGULATORY REQUIREMENTS

In addition to Reclamation's requirements for a Record of Decision, other Federal, State, local, or Tribal regulatory agencies may have permit or approval authority over portions of the proposed project (table VIII-1). In addition, table VIII-2 lists contracts and agreements that may apply to the SJRPNM and NIIP Amarillo Alternatives.

Federal requirements of the CWA include compliance under sections 401 and 402. Water quality certification (section 401) has recently been delegated to the Navajo Nation. The Navajo Nation Environmental Protection Agency and/or Navajo Nation would determine if a National Pollutant Discharge Elimination System (NPDES) Permit (section 402) would be needed for discharges into Navajo Nation waters.

Ambient air quality is protected by Federal regulations under the CAA. These regulations include compliance under the New Source Performance Standards and the requirements for the Prevention of Significant Deterioration. The Federal permitting process for the CAA has been delegated to the Navajo Nation.

Table VIII-1.—Federal, State, local, and Tribal permit approval and consultation requirements

Agency	Permit/action	Agency action
Federal and Tribal		
Advisory Council on Historic Preservation	Section 106, NHPA of 1966–programmatically agreement	Provide comments to Reclamation’s identification of cultural resources within areas of proposed Federal undertakings and consult with recommendations for mitigation of potentially adverse effects to cultural resource sites.
Council on Environmental Quality (CEQ)	NEPA compliance–environmental impact statement	Provide coordination with CEQ regulations (40 Code of Federal Regulations Parts 1500–1508).
Affected Indian Tribes/Tribal Nations	Secretarial Order 3175 and Indian Policy of Reclamation American Indian Religious Freedom Act of 1978, Executive Order 13007 of 1997 NAGPRA	Consult with Indian Tribal Governments on Indian Trust Assets. Identify and avoid impacts to sites sacred to the practice of Native American religion. Coordinate with Tribes/Tribal Nations. In conjunction with Tribes/Tribal Nations, involve project-area affected Tribes in developing a plan to treat Native American human remains encountered during project construction.
Affected Minority Groups and Low-Income Populations	Executive Order 12898, Environmental Justice, of 1994	Comply with Executive order.
U.S. Department of the Interior, U.S. Fish and Wildlife Service	FWCA Section 7, ESA Migratory Bird Treaty Act Bald Eagle Protection Act	Evaluate impacts; recommend mitigation for fish and wildlife habitat. Provide biological opinion on species of wildlife and plants that are federally listed; this act applies to all project features that may affect federally listed species or their critical habitats.
Department of the Treasury, Bureau of Alcohol, Tobacco, and Firearms	Explosive User’s Permit	Consider issuance of permits to purchase, store, and use explosives for site preparation during construction.

Table VIII-1.—Federal, State, local, and Tribal permit approval and consultation requirements (continued)

Agency	Permit/action	Agency action
Federal and Tribal (continued)		
Environmental Protection Agency	NPDES Permit (section 402), CWA	In conjunction with States and Tribes, review and issue NPDES Permit for discharges to State waters.
	Storm Water Discharge Permit, CWA	In conjunction with States and Tribes/Tribal Nations, review and issue Storm Water Discharge Permit for activities associated with construction activities.
	Section 401, Water Quality Certification, CWA	In conjunction with States and Tribes/Tribal Nations, consider issuance of Water Use and Crossing Permits.
	Section 404(r) Certification, CWA	In conjunction with States and Tribes/Tribal Nations, consider issuance of Water Use and Crossing Permits.
Department of the Army, U.S. Army Corps of Engineers	Section 404, CWA, permit issuance	Issue authorization for discharge of dredge or fill material into waters of the United States, including wetlands.
U.S. Department of the Interior, Bureau of Reclamation	Archaeological Resource Protection Act	Conduct archaeological excavations.
U.S. Department of the Interior, Bureau of Land Management	Rights-of-way construction approval	Consider issuing approval for the construction of the proposed project.
	Regulations of mining operations and gravel pits	Consider approval of activities involving construction of borrow pits.
U.S. Department of the Interior, Bureau of Indian Affairs (BIA) (with Tribal approval)	Rights-of-way construction approval	Consider issuing approval for the construction of the proposed project.
	Regulations of mining operations and gravel pits	Consider approval of activities involving construction of borrow pits.
	Road Crossing Permits	Consider issuance of permits for construction across BIA roads.
Navajo Nation Tribal Council	Rights-of-way construction approval	Consider issuing approval for the construction of the proposed project.
Navajo Nation Environmental Protection Agency	Water quality certification, CWA	Consider issuing certification for the construction of the proposed project.
	Air Quality Permit, CAA	Consider issuing permits or waivers for construction and operation emissions to the air.

Table VIII-1.—Federal, State, local, and Tribal permit approval and consultation requirements (continued)

Agency	Permit/action	Agency action
Federal and Tribal (continued)		
Navajo Nation Fish and Wildlife Department	Wildlife coordination, Navajo Nation Endangered Species Act	Consult on wildlife impacts involved with the construction of the proposed project.
Navajo Nation Historic Preservation Office	Section 106, NHPA of 1966; NAGPRA	Provide comments to Reclamation's identification of cultural resources within areas of proposed Federal undertakings, assess the eligibility of such resources for inclusion in the <i>National Register</i> , and consult with recommendations for mitigation of potentially adverse effects to cultural resource sites.
Navajo Nation Department of Water Resources	Water use permit	Consider issuance of water use permit
Navajo Tribal Utility Authority (NTUA)	Transmission and powerlines	Consider issuance of permits for crossing and connecting to existing NTUA facilities.
Navajo chapters	Local approvals	Develop information-sharing process.
Indian Tribal Councils	Indian Self-Determination and Education Assistance Act (Public Law 638)	Consult on level of involvement for design and construction.
New Mexico		
New Mexico Bureau of Mines and Mineral Resources	Regulation of mining operations and gravel pits	Consider approval of activities involving construction of borrow pits.
New Mexico Department of Game and Fish	FWCA, State-sensitive species coordination	Make recommendations of activities involving State-listed sensitive species.
New Mexico Environment Department, Air Quality Bureau	Air Quality Permits, CAA	Consider issuance of permits or waivers for construction and operation emissions to the air.
New Mexico Environment Department, Surface Water Quality Bureau	Section 401, Water Quality Certification, CWA	Consider issuance of Water Use and Crossing Permits.
	NPDES Permit, Section 402, CWA	Review and issue NPDES Permit for discharges to State waters.
	Storm Water Discharge Permit, CWA	Review and issue Storm Water Permit for activities associated construction activities.
	River, Stream Crossing Permit	Consider issuance of permits for crossing rivers, streams, and lakes in New Mexico.

Table VIII-1.—Federal, State, local, and Tribal permit approval and consultation requirements (continued)

Agency	Permit/action	Agency action
New Mexico (continued)		
New Mexico Office of Cultural Affairs (SHPO)	Section 106, NHPA of 1966, NAGPRA	Provide comments on Reclamation's identification of cultural resources within areas of proposed Federal undertakings, assess the eligibility of such resources for inclusion in the <i>National Register</i> , and consult with recommendations for mitigation of potentially adverse effects to cultural resource sites. Coordinate on other Native American issues.
New Mexico Department of Transportation	Road Crossing Permits	Consider issuance of permits for construction across State roads.
New Mexico Office of State Engineer	Diversion and Water Use Permits	Consider issuance of permits or waivers for water users.
New Mexico Archaeological and Historic Preservation (SHPO)	Comply with State burial law	Acquire permit to perform excavations on State or private lands where burials are anticipated.
County and local agencies		
San Juan County Commissioners	Road use and crossings	Coordinate agreement.
San Juan County Planning Department	Use Permits	Consider approval of activities where use is conditional in a particular zone.
McKinley County Commissioners	Road use and crossings	Coordinate agreement.
McKinley County Planning Department	Use Permits	Consider approval of activities where use is conditional in a particular zone.
City of Gallup	Use Permits	Consider approval of activities where use is conditional in a particular zone.
County/city governments	Local approvals	Develop information-sharing process.

Table VIII-2.—Contracts, legislation, and agreements that may apply to the proposed project

Contract, legislation, or agreement	Purpose
Colorado River Compact of 1922, Public Law 84-485	Allocation and management of water between Upper and Lower Colorado River Basins.
Upper Colorado River Basin Compact of 1948	The compact apportions water of the Upper Basin to the States of Arizona, Colorado, New Mexico, Utah, and Wyoming and establishes certain obligations for the States of the Upper Division.
Colorado River Storage Project Act of 1956 (70 Stat. 105)	Authorized construction of Navajo Dam and Reservoir. The proposed project has potential to become a participating project of the Colorado River Storage Project (CRSP) Act.
Jicarilla Apache Tribe Water Rights Settlement Act of 1992, Public Law 102-441 (Jicarilla Settlement Act)	The Jicarilla Apache Nation established legal rights to San Juan River Basin water rights that are based on the (1) 33,500 acre-foot per year (AFY) diversion and 25,500 AFY depletion from Navajo Reservoir or River and (2) 6,500 AFY diversion or 6,500 AFY depletion from the San Juan-Chama Project.
The Navajo Nation Treaty of 1849	Treaty placed Navajo people under the jurisdiction of the United States and ceased hostilities and promised perpetual peace.
Treaty of 1868	Navajo Nation lands were specifically set aside in the Treaty of 1868 (15 Stat. 667). An earlier treaty, signed and ratified in 1850 (9 Stat. 974), promised the Navajo people the designation of territories for their benefit.
Navajo Indian Irrigation Project (NIIP), Public Law 87-483	Public Law 87-483 (76 Stat. 96) authorized the Secretary of the Interior to construct, operate, and maintain the NIIP and initial stages of the San Juan-Chama Project as participating projects of the CRSP and for the purposes of furnishing water for the irrigation of irrigable and arable lands and for municipal, domestic, and industrial uses, providing recreation and fish and wildlife benefits, controlling silt, and other beneficial purposes. The Navajo Nation has a Navajo Reservoir water supply contract with the United States for the delivery of water to the NIIP for the principal purpose of furnishing irrigation water to 110,630 acres of land. The San Juan-Chama Project makes the average annual diversion of about 107,524 AFY from the upper tributaries of the San Juan River possible and conveys the water into the Rio Grande Basin in New Mexico.
Secretarial Contract No. 14-06-W-269	Agreement between the United States and Navajo Tribe of Indians for delivery of water from Navajo Reservoir, dated April 10, 1976.
Navajo-Gallup Water Supply Project	The Navajo Nation and the city of Gallup signed a Memorandum of Agreement on April 17, 1998, to proceed with project planning and resolve issues related to project development (attachment A). The Navajo Nation and the city of Gallup also executed a Memorandum of Understanding in October 2007 concerning water supplies for the proposed project (attachment B).

Table VIII-2.—Contracts, legislation, and agreements that may apply to the proposed project (continued)

Contract, legislation, or agreement	Purpose
<p>Omnibus Public Land Management Act of 2009, Public Law 111-11</p>	<p>The proposed project authorization was included in the recently enacted Omnibus Public Land Management Act of 2009, title X, part III (Public Law [P.L.] 111-11, March 30, 2009) (attachment P). The act authorizes the Secretary of the Interior (Secretary) to:</p> <ol style="list-style-type: none"> 1. Construct, operate, and maintain the proposed project 2. Allocate the capacity of the proposed project among the Navajo Nation and the city of Gallup 3. Enter into proposed project repayment contracts with the city of Gallup and the Jicarilla Apache Nation <p>In general, the Secretary, acting through the Commission of Reclamation, is authorized to design, construct, operate, and maintain the proposed project in substantial accordance with the preferred alternative in the draft environmental impact statement.</p> <p>The Omnibus Public Land Management Act of 2009 (P.L. 111-11) approved, ratified, and confirmed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (Navajo Settlement Agreement) under title X, part IV of the act. This planning report and final environmental impact statement does not analyze the Navajo Settlement Agreement; however, the act requires that all proposed project features shall be completed no later than December 31, 2024. Under the act, the Secretary shall execute an agreement consistent with the provisions of the act by December 31, 2010.</p>



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GLOSSARY

A

Acre-foot: A quantity or volume of water covering 1 acre to a depth of 1 foot (43,560 cubic feet).

Active storage: The amount of storage within a reservoir used for storage and release under normal operating parameters.

Alkaline: Having a pH 7.0 or above.

Arable: Suitable for farming.

Archaic: The Archaic period in the region is typified by a change from a big-game hunting emphasis to the hunting of smaller, modern game and the intensive collection of plant foods. Most sites of this period date between 8000 and 2000 BP (Before Present).

Artifact: A human-made object.

B

Base flow: Groundwater or surface water inflow to a river segment or its tributaries that is derived from natural or artificial storage and is commonly associated with periods of low flow.

Benthic: Bottom- or depth-inhabiting.

Berm: A wall of earth along a dam.

Bioaccumulation: The uptake and retention of nonfood substances by a living organism from its environment, resulting in a build-up of the substances in the organism.

Biodiversity: The variety of life and its processes, and the interrelationships within and among various levels of ecological organization.

Biological assessment: Analysis prepared by or under the direction of a Federal agency for the purpose of identifying potential impacts of a proposed action on endangered or threatened species and their critical habitat. The analysis is provided to the U.S. Fish and Wildlife Service either for information (when it has been concluded that no effect would occur) or with a request for consultation (when a possible effect has been identified).

Biological opinion: Document that states the opinion of the U.S. Fish and Wildlife Service as to whether a Federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

C

Candidate species: Plant or animal species not yet officially listed but which is undergoing a status review by the U.S. Fish and Wildlife Service as candidate for possible addition to the list of threatened and endangered species.

Coliform: Organisms common to the intestinal tract of humans and animals; the organisms' presence in waste water is an indicator of pollution.

Colorado pikeminnow: Formerly Colorado squawfish. The Colorado pikeminnow (*Ptychocheilus lucius*) is an endangered fish that is endemic to the Colorado River Basin.

Colorado River Compact: The 1922 Colorado River Compact apportioned the waters between the Upper and Lower Basins. The 1948 Upper Colorado River Basin Compact apportioned the waters between the Upper Basin States.

Colorado Ute Indian Water Rights Final Settlement Agreement, December 10, 1986 (Settlement Agreement): Describes Project-reserved water rights for the two Colorado Ute Tribes and details other benefits to the tribes.

Colorado Ute Indian Water Rights Settlement Act of 1988 (Public Law 100-585) (Settlement Act): Enters into law provisions of the Colorado Ute Indian Water Rights Settlement Agreement of 1986 and mandates the Tribal Development Fund and other provisions of the Settlement Agreement.

Connected actions: As defined by 40 Code of Federal Regulations 1508.25(a)(1), those actions which are interrelated with a proposed Federal action and which should be discussed in the same environmental impact statement.

Cooperating agency: Federal, State, Tribal, and local government agencies that have jurisdiction by law and special expertise with respect to all reasonable alternatives or significant environmental, social, or economic impacts associated with a proposed action that requires National Environmental Policy Act (NEPA) analysis. The Federal agency responsible for the NEPA analysis should determine whether such agencies are interested and appear capable of assuming the responsibilities of becoming a cooperating agency under 40 Code of Federal Regulations 1501.6.

Conservation: Reduction in applied water due to more efficient water use.

Cretaceous: Having the characteristics of chalk; relating to the Mesozoic era system of rocks.

Critical habitat: Defined in Section 3(5)(A) of the Endangered Species Act as: (1) the specific areas within the geographical area occupied by the species at the time it is listed, on which are found those physical and biological features (a) essential to the conservation of the species and (b) which may require special management considerations for protection; and (2) Specific areas outside the geographical area occupied by a species at the time it is listed upon a determination by the Secretary that such areas are essential for the conservation of the species.

Cubic foot per second (cfs): As a rate of streamflow, a cubic foot of water passing a reference section in 1 second of time. A measure of moving volume of water (1 cfs = 0.0283 cubic meter per second).

Cultural resources: Any buildings, sites, districts, structures, or objects significant in history, architecture, archeology, culture, or science.

Cumulative action: As defined in 40 Code of Federal Regulations 1508.25(a)(2), those actions, when viewed with other proposed actions, that have cumulatively significant impacts.

Cumulative impacts: Impacts that occur as a result of cumulative actions.

D

Depletion: To permanently remove water from a system for a specific use.

Dissolved oxygen: Oxygen that exists in water as a result of air/water mixing or aquatic photosynthesis. Sufficient quantities of dissolved oxygen in water are required to support fish and most other aquatic animals.

Diversion: Removing water from its natural course or location, or controlling water in its natural course or location, by means of a ditch, canal flume, reservoir, bypass, pipeline, conduit, well, pump, or other structure or device.

E

Effects/impacts: National Environmental Policy Act Guidelines §1508.8 state:

“Effects” include:

- (a) Direct effects, which are caused by the action and occur at the same time and place.
- (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects on natural resources (and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if, on balance, the agency believes that the effect will be beneficial.
- (c) Significant and potentially significant effects.

Endangered species: A species that is in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act (ESA): Federal law that authorizes and establishes the process for the protection of habitats and populations of species threatened with extinction. The stated purposes of the Federal Endangered Species Act of 1973, as amended, are to provide conservation of the ecosystems upon which endangered and threatened species depend and to establish and implement a program to conserve these species.

Entrainment: Process by which aquatic organisms, suspended in water, are pulled through a pump or other device.

Environment: All biological, chemical, and physical factors to which organisms are exposed.

Environmental impact statement: Detailed public document required by the National Environmental Policy Act for proposed major Federal actions having a significant effect upon the human environment. It is a formal document which must follow the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and directives for the Federal agency responsible for the project proposal.

It focuses on a description of the affected environment and a detailed analysis of the environmental consequences of the proposed action and its alternatives. It is released to the public and other agencies for review and comment. An environmental impact statement is used by the decisionmaking official(s) to make informed decisions concerning implementation of the selected alternative. The decision is documented in a Record of Decision.

Exchange: The release of water to a stream at one location in order to increase diversion at an upstream location, while still meeting downstream demands and bypass flow needs.

F

Fecal coliform: Bacteria formed in the intestinal tracts of animals. Their presence in water or sludge is an indicator of pollution and possible contamination by pathogens.

Federal Register: Periodical published daily (Monday through Friday, except on official holidays) by the Federal National Archives and Records Administration. It provides a uniform system for making available to the public regulations and legal notices issued by Federal agencies.

Fish and Wildlife Coordination Act: The Fish and Wildlife Coordination Act and related acts express the policy of Congress to protect the quality of the environment as it affects the conservation, improvement, and enjoyment of fish and wildlife resources. Under this act, any Federal agency that proposes to control or modify any body of water, or to issue a permit allowing control or modification of a body of water, must first consult with the U.S. Fish and Wildlife Service and State Fish and Game officials.

Floatable flow: The flow rate below which a particular river-related recreation activity would cease.

Flow: Used synonymously with “streamflow.” The volume of water passing a given point per unit of time.

Footprint: An outline of defined boundaries or parameters.

Forbs: Weeds or broad-leafed plants.

G

Gap Analysis: A comparison of the distribution of elements of biodiversity with that of areas managed for their long-term viability to identify elements with inadequate representation.

Groundwater: Water contained beneath the land surface of the earth that can be collected with wells or drainage galleries, or water that flows naturally to the Earth's surface via seeps or springs.

H

Headwater: The source and upper part of a stream; water upstream of a dam.

Hypolimnion: Bottom layer of a lake with essentially uniform colder temperatures.

I

Inflow: Water that flows into a body of water.

Interstate compact: An agreement between two or more States dealing with competing demands for a water resource beyond the legal authority of one State alone to solve. Such agreements require the consent of Congress and the States.

Invertebrate: Animals lacking a spinal column.

Irretrievable commitments of natural resources: Loss of production or use of resources as a result of a decision. It represents opportunities foregone for the period of time that a resource cannot be used.

Irreversible commitments of resources: Decisions affecting renewable resources, such as soils, wetlands, and waterfowl habitat. Such decisions are considered irreversible because their implementation would affect a resource that has deteriorated to the point that renewal can occur only over a long period of time or at great expense or because their use would cause the resource to be destroyed or removed.

L

Lacustrine: Lake and reservoir wetland habitat.

Loam: A soil consisting of a mixture of clay, silt, and sand.

M

Megawatt (MW): One million watts.

Mitigation: National Environmental Policy Act Guidelines §1508.20 states: “Mitigation” includes:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- (e) Compensating for the impact by replacing or providing substitute resources or environments.

As used in cultural resource compliance procedures: Any treatment of historic or prehistoric property that will offset adverse effects that may result from an agency’s action. As used concerning municipal and industrial water: Water delivered to industries and cities for uses, including human consumption, livestock and wildlife, recreation, and tourism development.

N

National Environmental Policy Act (NEPA): Directs Federal agencies to prepare an environmental impact statement for all major Federal actions that may have a significant effect on the human environment. NEPA states that it is the goal of the Federal Government to use all practicable means, consistent with other considerations of national

policy, to protect and enhance the quality of the environment. NEPA requires all Federal agencies to consider the environmental impacts of their proposed actions during the planning and decisionmaking process.

National Pollutant Discharge Elimination System (NPDES): This permit under section 402 of the Clean Water Act (33 USC 1251 et seq.) may be required if water quality is potentially affected by proposed actions or construction of wastewater treatment plants, or other structures.

National Register of Historic Places: A federally maintained register of districts, sites, buildings, structures, architecture, archeology, and culture.

Native American Graves Protection and Repatriation Act (NAGPRA): A Federal law, passed in 1990, that provides a process for museums and Federal agencies to return such Native American cultural items as human remains, funerary objects, sacred objects, and objects of cultural patrimony to lineal descendants, culturally affiliated Indian Tribes, and Native Hawaiian organizations.

Navajo Depletion Guarantee: The Navajo Nation developed a Navajo Depletion Guarantee that would keep the proposed project from exceeding the existing Endangered Species Act (ESA) (baseline and allow the proposed project to use undeveloped water in the existing ESA baseline until developed.

No Action Alternative: Under the National Environmental Policy Act, “no action” represents a projection of current conditions to the most reasonable future responses or conditions that could occur during the life of the project without any action alternatives being implemented. The No Action Alternative should not automatically be considered to be the same as the existing condition of the affected environment since reasonably foreseeable future actions may be taken whether or not any of the project action alternatives are chosen. Differences could result from other water development projects, land use changes, or municipal development. “No action” is therefore often described as “the future without the project.”

Nonpoint source pollution: Manmade or man-induced alteration of the chemical, physical, biological, or radiological integrity of water, originating from any source other than a point source.

Nutrients: Animal, vegetable, or mineral substances which sustain individual organisms and ecosystems.

P

Paleocene: Relating to the oldest series or epoch of the Tertiary period.

pH: Indicator of acidity. This expression of hydrogen ion concentration is typically expressed in a scale from 1 to 14, 1 being the most acidic and 14 being the most basic.

Point source pollution: Any discernible, confined, or discrete conveyance from which pollutants are or may be discharged, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft.

Practically irrigable acreage (PIA): The amount of acreage that can be practicably irrigated in consideration of physical and economic factors. The PIA standard is often used as a measure to help define Indian Tribes' claims to water that might be needed to fulfill the purposes for which their land reservations were set aside by Congress.

R

Reasonable and prudent alternative (RPA): Regulations implementing the Endangered Species Act, section 7, define reasonable and prudent alternatives as alternative actions, identified during formal consultation with the U.S. Fish and Wildlife Service, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

Record of Decision (ROD): A written document which states the decision made, describes the environmental factors considered, the preferred plan, and the alternatives considered in the environmental impact statement.

Recreation day: Analogous to user day, which is the participation in a recreation activity at a given resource during a 24-hour period by one person.

Related actions: As defined in 40 Code of Federal Regulations 1508.25(a)(3), those actions that have similarities to a proposed action that provide a basis for evaluation together, such as common timing or geography.

Restoration/re-vegetation: Re-establishing a habitat or plant community in an area that historically supported it.

Riffle: A water habitat characterized by water flowing rapidly over a coarse substrate.

Riparian: Living on or adjacent to a water supply such as a riverbank, lake, or pond.

Riprap: Stones placed on the face of dams, stream banks, or other land surfaces to protect the surface from erosion.

S

Salmonids: The family of fish which includes trout, salmon, and char.

San Juan River Basin Recovery Implementation Program (SJRBRIP): A program required by the 1991 Biological Opinion for the Animas-La Plata Project that has the dual goals of (1) conserving populations of endangered fish species in the San Juan River consistent with recovery under the Endangered Species Act and (2) proceeding with water development in the San Juan River Basin consistent with interstate compacts, court decrees, and Federal trust responsibilities to Indian Tribes. Participants in the program include four U.S. Department of the Interior agencies (the U.S. Fish and Wildlife Service, the Bureau of Reclamation, the Bureau of Indian Affairs, and the Bureau of Land Management), two States (Colorado and New Mexico), four Indian Tribes (the Navajo Nation, the Jicarilla Apache Nation, the Southern Ute Tribe, and the Ute Mountain Ute Tribe), and water development interests in the San Juan River Basin.

Scoping: An early, open process for determining the scope of issues to be addressed and identifying the significant issues related to a proposed action. Scoping meetings are a part of the process.

Section 7 consultation: All Federal agencies are required to consult with the U.S. Fish and Wildlife Service on actions that may affect endangered or threatened species and their designated critical habitat. This consultation requirement is under section 7 of the Endangered Species Act.

Seep: A spot where groundwater oozes slowly to the surface, usually forming a pool.

Selenium: A naturally occurring trace element present in many geological formations in the West. Humans and animals require selenium in small amounts for good health, but concentrations can cause adverse reactions. The irrigation process can cause elevated selenium concentrations.

Shiprock irrigation projects: Fruitland, Hogback, Cudei, and Cambridge.

Siphon: A pipe that conveys water between two sections of a canal by dipping down across a valley or draw.

Special status species: Any species listed or proposed for listing under the Endangered Species Act (ESA). A general term for any species listed or proposed for listing as threatened or endangered under the ESA, a species considered rare, or a species of special concern under State or Tribal protection.

Spillway: A passage for water to run over an obstruction, such as a dam.

Streamflow: The volume of water passing a given point per unit of time.

Substrate: The base on which an organism lives; a substance acted upon.

Sustainability: Refers to the maintenance of a landscape and lifestyle in some agreed-upon form that includes both a space for human economic activity and a space to preserve the ecosystem under natural controls and evolution.

Swale: A wide, shallow ditch, usually grassed or paved.

T

Tailwater: Water below a dam or hydropower development.

Tertiary: Relating to the first period (Cenozoic) system of rocks, marked by the formation of high mountains.

Threatened species: A legal classification for a species that is likely to become endangered within the foreseeable future.

Topography: Physical shape of the ground surface.

Total dissolved solids (TDS): Total amount of dissolved material, organic and inorganic, contained in water.

Toxin: Poisonous substance, generally from a plant or animal.

Trace element: A trace element is one that is usually only present in “trace” or barely measurable amounts. When the name was developed, analytical chemistry was in its infancy and incapable of quantifying the amount or concentration of naturally occurring elements in soil or water other than the most common ones such as calcium, magnesium, sodium, potassium, chloride, carbon, and sulfur.

Traditional cultural property (TCP): A site or resource that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community.

Turbidity: The scattering and absorption of light that makes the water look murky. Caused by the content and shape of matter suspended in the water.

U

Upper Basin: Those parts of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming within and from which waters naturally drain into the Colorado River system above Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River system that are beneficially served by water diverted from the system above Lee Ferry.

V

Vertebrate: Animal species with a spinal column.

W

Weir: A structure built across an open channel for measuring, diverting, or controlling water flow.

Wetlands: Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mud flats, and natural ponds.

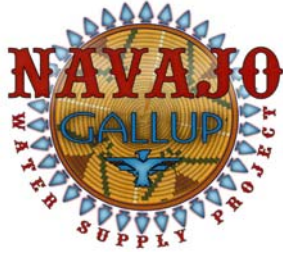
Jurisdictional – Subject to regulation under the Clean Water Act.

Nonjurisdictional – Subject to consideration under the U.S. Fish and Wildlife Coordination Act.

Wetted perimeter: The distance along the bottom and sides of a stream, creek, or channel in contact with the water.

Wild and Scenic Rivers Act (Public Law 90-542): The policy of this act selects certain rivers possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, or other similar values, for preservation in free-flowing conditions. Those selected under recreational criteria may have undergone some diversion or impoundment in the past. Selected rivers and streams have been placed into the National Rivers Inventory by Acts of Congress; others are proposed for inclusion into the system.

Winters Doctrine: Provides that the establishment of a Indian Reservation impliedly reserves the amount of water necessary for the purposes of the reservation. Upheld by the U.S. Supreme Court.



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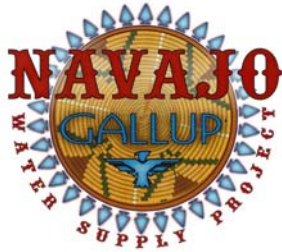
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ATTACHMENTS

Attachment

- A** Memorandum of Agreement between the City of Gallup and the Navajo Nation to Cooperate on the Navajo-Gallup Water Supply Project (IGRF-33-98)
- B** Memorandum of Understanding between the Navajo Nation and the City of Gallup Concerning Water Supplies for the Navajo-Gallup Water Supply Project (October 2007)
- C** Resolution of the Resources Committee of the Navajo Nation Council
- D** Resolutions of the Navajo Nation Chapters
- E** Resolutions of the Upper Colorado River Commission
- F** Letter from Jicarilla Apache Tribe to the Bureau of Reclamation (February 16, 2001)
- G** Letter from Honorable Kelsey A. Begaye, President of the Navajo Nation, and Honorable John Peña, Mayor of the city of Gallup, to Eluid Martinez, Commissioner of the Bureau of Reclamation (November 22, 2000)
- H** Letters from Eluid L. Martinez, Commissioner of the Bureau of Reclamation (December 26, 2000), and Rick L. Gold, Regional Director, Upper Colorado Regional Office, to Honorable Kelsey A. Begaye, President of the Navajo Nation, and Honorable John Peña, Mayor of the city of Gallup (June 13, 2001)
- I** Preferred Alternative
- J** Screening Report
- K** Vegetation
- L** List of Wildlife Found in the Project Area and Habitat Associations
- M** Soil and Geology Descriptions
- N** Hydrologic Determination, 2007, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico
- O** Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin
- P** Northwestern New Mexico Rural Water Projects Act (Public Law 111-11, title X, subtitle B)



ATTACHMENT A

Memorandum of Agreement
(IGRF-33-98)

**RESOLUTION OF THE
INTERGOVERNMENTAL RELATIONS COMMITTEE
OF THE NAVAJO NATION COUNCIL**

**Approving a Memorandum of Agreement Between the City of
Gallup and the Navajo Nation to Cooperate on the
Navajo-Gallup Water Supply Project**

WHEREAS:

1. The Intergovernmental Relations Committee of the Navajo Nation Council is established to ensure the presence and voice of the Navajo Nation, pursuant to 2 N.N.C §822(B), and has the power to authorize, review and approve agreements between the Navajo Nation and any state authority upon the recommendation of the standing committee with oversight authority for such agreement, pursuant to 2 N.N.C. §824(B)(6); and

2. Attached to this resolution as Exhibit A is a proposed Memorandum of Agreement between the City of Gallup and the Navajo Nation to cooperate on the Navajo-Gallup Water Supply Project; and

3. The Resources Committee of the Navajo Nation Council is charged with ensuring the optimum utilization of all resources of the Navajo Nation and to protect the rights, interests and freedoms of the Navajo Nation and People, pursuant to 2 N.N.C. §693 (1995); and

4. By Resolution RCJA-13-98, attached to this resolution as Exhibit B, the Resources Committee of the Navajo Nation Council determined that the water resources of the Navajo Nation are essential to provide a permanent homeland for the Navajo people, that protection of such water resources is essential in order to protect the health, welfare and the economic security of the citizens of the Navajo Nation, that the proposed Memorandum of Agreement would provide opportunity to advance this vitally needed project and that executing this agreement is in the best interests of the Navajo Nation; and

5. The Intergovernmental Relations Committee of the Navajo Nation Council accepts the recommendation of the Resources Committee and concurs that executing the proposed Memorandum of Agreement between the City of Gallup and the Navajo Nation to cooperate on the Navajo-Gallup Water Supply Project is in the best interests of the Navajo Nation.

NOW THEREFORE BE IT RESOLVED THAT:

The Intergovernmental Relations Committee of the Navajo Nation Council authorizes the execution of the proposed Memorandum of Agreement between the Navajo Nation and the City of Gallup to cooperate on the Navajo-Gallup Water Supply Project, attached as Exhibit A.

CERTIFICATION

I hereby certify that the foregoing resolution was duly considered by the Intergovernmental Relations Committee of the Navajo Nation Council at a duly called meeting at Window Rock, Navajo Nation (Arizona), at which a quorum was present and that same was passed by a vote of 4 in favor, 2 opposed and 0 abstained, this 23rd day of February, 1998.



Kelsey A. Begaye, Chairperson
Intergovernmental Relations Committee

Motion: Rex Morris, Jr.
Second: Genevieve Jackson

MEMORANDUM OF AGREEMENT

Between the Navajo Nation and the City of Gallup **To Cooperate on the Navajo-Gallup Water Supply Project.**

WHEREAS:

1. The Navajo Nation and the City of Gallup have severe water quality and water quantity problems; and
2. During the Congressional Hearings for the proposed Navajo Indian Irrigation Project (NIIP), the New Mexico State Engineer testified that NIIP would be part of the regional water infrastructure intended to provide water from Navajo Dam to Navajo Communities in northwest New Mexico and to the City of Gallup (Hearings before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, S. 3648, July 9 and 10, 1958); and
3. In the 1960's, the Bureau of Reclamation first considered a water pipeline project that would bring water to Navajo Communities in northwest New Mexico and to the City of Gallup, and the Bureau was authorized under Public Law 92-199 (approved December 15, 1971) to conduct feasibility studies for such a project; and
4. In 1984, the Bureau of Reclamation completed a draft Environmental Impact Statement for the proposed Gallup-Navajo Indian Water Supply Project which evaluated three alternative routes for a water pipeline and recommended a route parallel to Highway 666; and
5. Following public hearings in 1984 and 1985, the Navajo Nation recommended reformulation of the project to serve additional communities along Highway 371, and a revised EIS in 1985 supported the recommendation of the route along Highway 371; and
6. By letter of March 5, 1992 from Navajo Nation Vice President Marshall Plummer to Gallup Mayor George Galanis, the Navajo Nation agreed to join the City of Gallup in further discussions to evaluate the project; and
7. In 1992, discussions commenced between technical staff from the Navajo Nation and the City of Gallup to further evaluate the project; and

8. In 1992, Congress authorized \$300,000 for a preliminary reassessment of the project by the Bureau of Reclamation, and in subsequent years, Congress has authorized additional funding to develop a project definition, conduct a biological assessment, and provide an assessment of alternatives; and

9. In 1995, the Navajo Nation entered into Cooperative Agreement No. 5-FC-40-17490 (authorized by RCAU-205-95 and IGRS-190-95) with the Bureau of Reclamation to engage in public meetings and technical studies related to the project; and

10. Seventeen Chapters within the preliminary project area, including Burnham, Becenti, Coyote Canyon, Crownpoint, Dalton Pass, Nageezi, Whitehorse Lake, Mexican Springs, St. Michaels, Tseyatoh, Huerfano, Lake Valley, Pueblo Pintado, Standing Rock, Twin Lakes, Whiterock, Fort Defiance, Tohatchi, and Naschitti have approved continued planning for the project; and

11. By letter of February 15, 1996 Navajo Area Director Wilson Barber, committed the Bureau of Indian Affairs to serve as the lead agency for consultation with the Fish and Wildlife Service concerning compliance with the requirements of the Endangered Species Act, and directed the Bureau of Indian Affairs-Navajo Indian Irrigation Project Office to initiate this consultation as quickly as possible.

NOW, THEREFORE, THE CITY OF GALLUP AND THE NAVAJO NATION AGREE THAT:

1. A cooperative effort by the Navajo Nation and the City of Gallup (the Parties) to proceed with the planning and development of the Navajo-Gallup Water Supply Project is in the best interests of the Parties; and

2. The Parties are committed to a project that will work conjunctively with the Navajo Indian Irrigation Project and will otherwise be developed in a manner that is consistent with the water rights of the parties; and

3. The Parties are committed to a project that will result in a fair and equitable distribution of project water between the City of Gallup and the Navajo communities; and

4. The Parties are committed to cooperatively investigate all viable alternative project configurations, including a pipeline from the San Juan River; and

5. In order to ensure that the project will be in compliance with the requirements of the Endangered Species Act, the Parties support commitment of the Bureau of Indian Affairs to engage in consultation with the Fish and Wildlife Service as quickly as possible; and

6. The Parties will work together to resolve issues affecting the implementation of the Project; and

7. The planning efforts between the Navajo Nation and the City of Gallup will be voluntary and are without prejudice to any position either party may assert in the San Juan River General Stream Adjudication, or in any other matter concerning the water resources of the Parties.

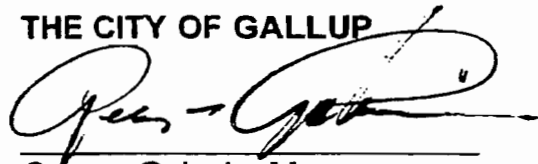
This Memorandum of Agreement was executed on this 17th day of April, 1998.

THE NAVAJO NATION

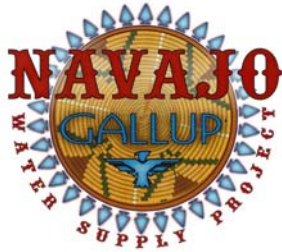


Thomas E. Atchitty, President

THE CITY OF GALLUP



George Galanis, Mayor



ATTACHMENT B

Memorandum of Understanding between
the Navajo Nation and the City of Gallup
Concerning Water Supplies for the Navajo-
Gallup Water Supply Project (October 2007)

**MEMORANDUM
OF
UNDERSTANDING
BETWEEN THE NAVAJO NATION
AND
THE CITY OF GALLUP
CONCERNING WATER SUPPLIES FOR THE
NAVAJO-GALLUP WATER SUPPLY PROJECT**

PREAMBLE:

In 1971, Congress, through Public Law 92-199, authorized feasibility studies to provide a reliable and sustainable municipal water supply system that would serve the eastern portion of the Navajo Indian Reservation and the City of Gallup.

In April of 1998, the Navajo Nation and the City of Gallup agreed that the Navajo Nation and the City of Gallup have severe water quality and water quantity problems, and stated their intent to cooperate on the planning and development of the Navajo Gallup Water Supply Project (NGWSP or the Project) to serve the eastern portion of the Navajo Indian Reservation and the City of Gallup (City).

In December of 2000, the Northwest New Mexico Council of Governments completed a feasibility level study of the City's transmission and storage facilities needed to convey NGWSP water through the City and to the Navajo communities of Breadsprings, Chichiltah, Church Rock, Iyanbito, Mariano Lake, Pinedale, Red Rock, and Manuelito Chapters, which surround the City. These facilities are referred to as the Gallup/Rural Navajo Regional Water System (Gallup Regional System or System). Some of these System facilities are currently under construction utilizing a combination of State Water Trust Board funds, Indian Health Service funds, and other funds. The new facilities constructed as part of the Regional System are projected to have the capacity to provide up to an additional 5,000 acre-feet per year for the City and approximately 5,000 acre-feet per year for the Navajo communities. The initial water supply for this additional capacity is ground water. When the NGWSP delivers San Juan River water to the System, the water supply will be primarily surface water.

In November of 2001 the City of Gallup, Navajo Tribal Utility Authority (NTUA) and Navajo Area Indian Health Service entered into an agreement as part of the planning for the Gallup Regional System. In this agreement the City under certain terms and conditions will supply water to some 27 Navajo homes outside the City boundaries. Waterlines to these Navajo homes have been constructed.

In March of 2002 the Navajo Nation, through Resolution RCMA-16-02, selected the preferred alternative of the NGWSP that is contemplated in the San Juan River settlement between the Nation and the State. This alternative includes 7,500 acre-feet per year of capacity for the City, 1,200 acre-feet per year of capacity for the Jicarilla Apache Nation, and 29,000 acre-feet per year of capacity for the Navajo Nation in New Mexico and Arizona. Among other components, this alternative includes the San Juan Lateral along Highway 491 serving Beclaibito, Cudei, Hogback, Nenahnezad, San Juan, Shiprock, Upper Fruitland, Naschitti, Newcomb, Sanostee, Sheep Springs, Tohatchi, Twin Lakes, and Two Grey Hills Chapters of the Navajo Nation, and the Cutter Lateral serving Burnham, Huerfano, Nageezi, Counselor, Pueblo Pintado, Ojo Encino, Whitehorse Lake, and Torreon Chapters of the Navajo Nation and the Jicarilla Apache Nation.

In May of 2003, the City held a Town Hall on Water where approximately eighty members of the public, including officials of the Navajo Nation, discussed water issues facing the City and the Navajo Nation. On June 24, 2003, the Gallup City Council passed resolution R2003-11 adopting the recommendations of

the Town Hall, which endorsed the NGWSP and called upon the City leadership to work cooperatively with the Navajo Nation to advance the interest and prospects of the Project.

Since 2003, the Navajo Nation, the Navajo Area Indian Health Service, the Navajo Tribal Utility Authority, the United States Bureau of Reclamation, the United States Bureau of Indian Affairs, the City, and the Northwest New Mexico Council of Governments, working together through the NGWSP Steering Committee, received approximately \$5,000,000 in funding from the State of New Mexico for the design and construction of the Gallup Regional System, and approximately \$17,000,000 for the Cutter Regional System.

In April 2005, the Navajo Nation and the State of New Mexico executed a Settlement Agreement to settle the Navajo Nation's water rights claims within the San Juan River basin in New Mexico. The settlement will guarantee to the Navajo Nation San Juan River depletion rights of 325,670 acre-feet per year, including 20,780 for Navajo uses by the NGWSP in New Mexico. The Nation will have the right to lease its San Juan River settlement water. The Settlement Agreement requires congressional legislation to ratify the settlement and to authorize the construction of the NGWSP, specifically the Project configuration selected by the Navajo Nation in 1998.

In April 2007, Senators Bingaman and Domenici introduced settlement legislation S. 1171 -- the Northwestern New Mexico Rural Water Projects Act to ratify the settlement and to authorize the construction of the NGWSP. Similar legislation was introduced by Congressman Tom Udall as H.R. 1970.

The specific details of the authorizing legislation describing the terms and conditions for the City and Jicarilla Apache Nation to participate in the NGWSP have not been finalized. These terms and conditions will be developed as Congress considers S. 1171 and H.R. 1970. These terms and conditions include the determination of the repayment costs for the NGWSP, including the Cutter Lateral, and the determination of the extent of federal participation in the construction of the NGWSP. The outcome of these determinations may impact the City's and the Jicarilla Apache Nation's position as participants in the NGWSP and may effect the negotiation of the water supply agreements.

In March 2007, the Bureau of Reclamation released the Draft Environmental Impact Statement and Planning Report for the NGWSP (DEIS). The cost estimate for the NGWSP included in the DEIS was approximately \$720 million based on 2004 construction indices. The Bureau of Reclamation is revising those estimates to reflect 2007 costs, and the ultimate cost of the Project could be significantly greater. The Federal Administration does not support S. 1171 and H.R. 1970 because of the costs of the Project, and the legislation faces opposition in Congress for similar reasons. The legislation is not likely to succeed unless it can be demonstrated that if built, there will be water for all the Project uses.

Presently, the City of Gallup does not have a source of water for use in the Project. This MOU is intended to describe a mechanism or process that can be utilized to secure the City of Gallup a source of water for the Project.

TERMS AND COMMITMENTS:

1. Exchange of Groundwater. Construction of the Gallup Regional System helps communities surrounding Gallup receive water prior to the construction of the NGWSP. The source of water prior to construction of NGSWP is groundwater. In order to provide a supply of water for the Navajo Nation communities to be served by the Gallup Regional System, the Navajo Nation and the City of Gallup agree to exchange up to 500 acre-feet per year of groundwater per year. This exchange will give the Navajo Nation and the City of Gallup greater flexibility to meet the region's water needs prior to

construction of the NGWSP. For example, water from City wells may provide supplies for delivery to the chapters south of or surrounding Gallup while water from Navajo wells may provide delivery to the north side of the City's delivery area. In order to facilitate this exchange:

a. The Navajo Nation and the City of Gallup will determine the conditions and rates for groundwater that will supply the Gallup Regional System prior to construction and completion of the NGWSP. The rates will reflect an equitable price to address NTUA and City delivery costs, the value to the Navajo Nation and to the City for the lost opportunity to use its respective groundwater for other purposes such as long-term drought protection, and a capital improvement component that the Navajo Nation and the City can invest in the NGWSP and related facilities at their discretion.

b. The City will pay NTUA for the receipt of some portion of the 500 acre-feet per year based on a "take or pay" fee structure based on the ability of NTUA to deliver such water. NTUA will pay for the receipt of some portion of the 500 acre-feet per year based on a "pay as you go" fee structure.

c. At the end of the exchange period, if either the Navajo Nation or the City has exceeded its aggregate, the exceeding party will offset the difference by supplying water from the NGWSP to the non-exceeding party.

d. The exchange period will end when the San Juan Lateral is operational unless both parties mutually extend it.

2. City of Gallup Surface Water Supply for the First 25 Years of NGWSP. The City of Gallup does not have water rights to the San Juan River, nor has it secured a source of surface water for use in the Project. The Navajo Nation is committed to working with the City of Gallup to find a surface water supply for the project. During the first 25 years of the Project, it is likely that the source of water for the City of Gallup will be out of the Navajo Reservoir Supply Contract to be executed between the Navajo Nation and the Secretary of the Interior as part of the Navajo Nation's San Juan River settlement. The Navajo Nation's Navajo Reservoir Supply Contract is anticipated to be 22,654 acre-feet per year for NGWSP uses in New Mexico. The City's water uses in the NGWSP are not to exceed 7,500 acre-feet per year. It is anticipated that the Navajo Nation could lease up to 7,500 acre-feet per year for the first 25 years of the Project out of its Navajo Reservoir Supply Contract without diminishing any anticipated Navajo demands. Accordingly:

a. The Navajo Nation and the City of Gallup agree to negotiate a subcontract of water from the Navajo Nation's Navajo Reservoir Supply Contract for a water supply not to exceed 7,500 acre-feet per year for a term of 25 years following completion of the Project.

b. The terms of the subcontract can not be fully ascertained at present, but the City of Gallup agrees that it will pay the Navajo Nation an equitable price for the supply of water based on such factors as:

i. the fair market value of the water;

ii. the Navajo Nation's water fee structure established by the Navajo Nation Water Code;

iii. the OM&R costs incurred by NTUA to operate the NGWSP and the need to defray these costs in order to provide affordable water utilities to the Navajo people;

iv. the water fees paid by other municipalities similarly situated;

v. the overall cost of water delivered to the City of Gallup, taking into account the costs of water delivery;

vi. incentives to encourage the acquisition and/or development of alternate water supplies by the City of Gallup; and

vii. consideration of the value provided by the City of Gallup by its conveyance of water to Navajo communities through the Gallup Regional System.

c. The terms of the subcontract should be negotiated prior to commencement of construction of the NGWSP. In order to ensure that a subcontract will be in place prior to construction of the Project, the Navajo Nation and the City of Gallup agree to have in place prior to Congressional authorization of the project, a set of Principles of Understanding that will set forth the basic parameters of the subcontract, including a dispute resolution process in the event that the terms and conditions of the subcontract cannot be agreed upon.

d. The City of Gallup intends to acquire alternate sources of water as may be feasible in order to secure a permanent water supply.

e. The Navajo Nation intends to use the proceeds from the subcontract for:

i. Defraying the operation, maintenance, and replacement costs incurred by NTUA to operate the Project; and/or

ii. Building distribution systems from the Project facilities to Navajo homes and communities; and

f. Nothing in any agreement between the Navajo Nation and the City of Gallup should foreclose the possibility that some or all of the 7,500 acre-feet of supply for the first 25 years of the Project could be provided by a subcontract between the Jicarilla Apache Nation and the City of Gallup or from some other source.

3. City of Gallup Surface Water Supply After the First 25 Years of NGWSP. In the event that the City of Gallup has not secured a permanent supply of surface water for some or all of the 7,500 acre-feet for its use in the Project, the City may still require a subcontract from the Navajo Reservoir water supply. Based on the projected Navajo water demands for NGWSP, the Navajo Nation may not be able to subcontract 7,500 acre-feet of supply after the first 25 years of the Project out of the 20,780 acre-feet of the Navajo Nation's Navajo Reservoir supply contract for NGWSP uses in New Mexico. Therefore, the Navajo Nation cannot at this time commit to a subcontract beyond 25 years, but will continue to work with the City of Gallup to find a surface water supply for the project.

4. Other Commitments.

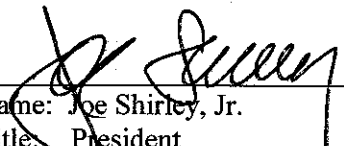
a. The Navajo Nation and the City of Gallup will work together to secure funds for the construction, extension or upgrade of new or existing conveyance and distribution systems for recipient communities that lack distribution systems or have inadequate distribution systems.

b. The Navajo Nation and the City of Gallup will continue to support the construction of the Cutter Lateral and associated infrastructure through in-kind resources, utilizing water proceeds and leveraging state and federal programmatic dollars.


c. In order to minimize the capital costs of the NGWSP, the Navajo Nation and the City of Gallup agree to provide access for all necessary rights-of-way without imposing fees, or to otherwise seek consideration for the use of their lands for the Project, on each other or on the United States. It is understood that the parties, on their own behalf or on behalf of their constituents, may request compensation for damages or disturbance of the surface uses arising out of the construction or operation of the Project.

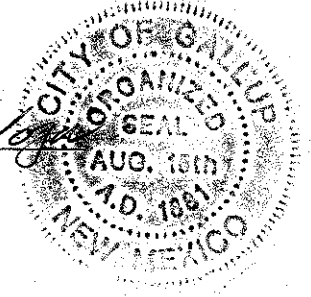
Signatures:

NAVAJO NATION


Name: Joe Shirley, Jr.
Title: President
Date: OCT 30 2007

CITY OF GALLUP


Name: Harry Mendoza
Title: Mayor
Date:





ATTACHMENT C

Resolution of the Resources Committee
of the Navajo Nation Council

RESOLUTION
OF THE RESOURCES COMMITTEE
OF THE NAVAJO NATION COUNCIL

Supporting the Selection of the San Juan River (PNM) Alternative as the Preferred
Alternative for the Navajo-Gallup Water Supply Project

WHEREAS:

1. Pursuant to 2 N.N.C. § 693, the Resources Committee of the Navajo Nation Council is charged with “insuring the optimum utilization of all resources of the Navajo Nation and to protect the rights, and interests and freedoms of the Navajo Nation and People”; and
2. Pursuant to 2 N.N.C. § 695 (B) (14), the Resources Committee of the Navajo Nation Council is the legislative oversight authority for the Division of Natural Resources, including the Department of Water Resources; and
3. As acknowledged in Section 101 of the Navajo Nation Water Code, 22 N.N.C. Section 1101, the water resources of the Navajo Nation are essential to provide a permanent homeland for the Navajo People; and protection of such water resources is essential in order to protect the health, the welfare and the economic security of the citizens of the Navajo Nation; and
4. The Navajo Nation and the City of Gallup have severe water quality and supply problems; and
5. During the Congressional Hearings for the proposed Navajo Indian Irrigation Project (NIIP), the New Mexico State Engineer testified that NIIP would be part of the regional water infrastructure intended to provide water from Navajo Dam to Navajo Communities in the northwest New Mexico and to the City of Gallup (Hearings before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, S.3648, July 9 and 10, 1958); and
6. Public Law 87-483, 76 Stat. 96 (1962), authorized the construction of the Navajo Indian Irrigation Project and authorized the use of NIIP facilities for municipal purposes, thereby recognizing the need for additional water to be developed for municipal purposes within the Navajo Nation; and
7. In the 1960’s, the U.S. Bureau of Reclamation first considered a water pipeline project that would bring water to Navajo Communities in northwest New Mexico and to the City of Gallup, and the Bureau was authorized under Public Law 92-199 (approved December 15, 1971) to conduct feasibility studies for such a project; and

8. In 1984, the U.S. Bureau of Reclamation completed a draft Environmental Impact Statement for the Gallup-Navajo Indian Water Supply Project (EIS) which evaluated three alternative routes for a water pipeline and recommended a route parallel to Highway 666; and

9. Following public hearings in 1984 and 1985, the Navajo Nation recommended reformulation of the project to serve additional communities along Highway 371, and a revised EIS in 1985 supported the recommendation of the route along Highway 371; and

10. By letter of March 5, 1992 (attached as Exhibit "A") from Navajo Nation Vice President Marshall Plummer to Gallup Mayor George Galanis, the Navajo Nation agreed to join the City of Gallup in further discussions to evaluate the project; and

11. In 1992, discussions commenced between technical staff from the Navajo Nation Department of Water Resources and the City of Gallup to further evaluate the project; and

12. In 1992, Congress authorized \$300,000 for a preliminary reassessment of the pipeline by the U.S. Bureau of Reclamation, and in subsequent years, Congress has authorized additional funding to develop a project definition, conduct a biological assessment, and provide an assessment of alternatives; and

13. In 1995, the Navajo Nation entered into Cooperative Agreement No. 5-FC-40-17490, authorized by IGR-190-95 and RCAU-205-95, with the U.S. Bureau of Reclamation to engage in public meetings and technical studies related to the project; and

14. As a result of the public meetings, seventeen (17) chapters within the preliminary project area, including Burnham, Becenti, Coyote Canyon, Crownpoint, Dalton Pass, Nageezi, Whitehorse Lake, Mexican Springs, St. Michaels, Tseyatoh, Huerfano, Lake Valley, Pueblo Pintado, Standing Rock, Twin Lakes, Whiterock, Fort Defiance, Tohatchi, and Naschitti, approved continued planning for the project; and

15. By letter of February 15, 1996 (attached as Exhibit "B"), Navajo Area Director Wilson Barber committed the U.S. Bureau of Indian Affairs to serve as the lead agency for consultation with the Fish and Wildlife Service concerning compliance with the requirements of the Endangered Species Act, and directed the U.S. Bureau of Indian Affairs-Navajo Indian Irrigation Project Office to initiate this consultation as quickly as possible; and

16. On October 7, 1996, the Resources Committee of the Navajo Nation Council directed the staffs of the Navajo Department of Justice and Water Resources to prepare a memorandum of agreement with the City of Gallup that protects the Navajo Nation's interests; and

17. By letter of April 11, 1997 (attached as Exhibit "C"), Navajo Nation President Albert Hale committed the Navajo Nation to continue its cooperative efforts and to prepare a memorandum of agreement with the City of Gallup that protects the Navajo Nation's interests while providing the City with adequate assurances of meaningful project participation; and

18. On April 17, 1998, George Galanis, the Mayor of the City of Gallup, and Thomas Atcitty, President of the Navajo Nation, signed an agreement to cooperate on the planning for the Navajo-Gallup Water Supply Project (agreement attached as Exhibit "D"); and

19. By letter of August 5, 1998, Navajo Nation President Milton Bluehouse to New Mexico Senator Pete Domenici (attached as Exhibit "E"), the Navajo Nation expressed its support for the completion of the Final Plan Report for the Navajo-Gallup Water Supply Project and the completion of the necessary National Environmental Protection Act and Endangered Species Act compliance activities; and

20. By letter of March 2, 1999, from Navajo Nation President Kelsey Begaye to Senator Domenici (attached as Exhibit "F"), the Navajo Nation expressed its continued support for the completion of the Final Plan Report for the Navajo-Gallup Water Supply Project and the completion of the necessary National Environmental Protection Act and Endangered Species Act compliance activities; and

21. As a result of that planning process, in January 2002, the Bureau of Reclamation completed appraisal level designs and cost estimates for six Project alternatives including the San Juan River (PNM) Alternative which is made up of two separate lateral systems, the San Juan Lateral and the Cutter Lateral; and

22. The San Juan Lateral would divert water from the San Juan River upstream from Shiprock, New Mexico at, or near, the existing Public Service Company of New Mexico (PNM) diversion structure, and treat and deliver the water west along Highway N36 and south along U.S. Highway 666 to communities in the western portion of the Navajo Nation and the City of Gallup, and the Cutter Lateral would obtain water from the NIIP system from the existing Cutter Reservoir, and treat and deliver the water south to communities in the eastern portion of the Navajo Nation and the Jicarilla Apache Nation; and

23. In compliance with the National Environmental Protection Act, the Bureau of Reclamation, the City of Gallup and the Navajo Nation developed an Alternative Selection Criteria that included: (a) capital cost per acre-foot; (b) operation, maintenance, and replacement cost per acre-foot; (c) impacts on endangered species; (d) other environmental impacts; (e) water quality; (f) socioeconomic impacts; (g) acceptability; and (h) risk; and

24. Based on the Alternative Selection Criteria, the San Juan River (PNM) Alternative is the preferred alternative, and as such will be a candidate for further detailed design and cost estimates, and for investigation of environmental impacts; and

25. At the Resources Committee meeting held on January 22, 2002, the Department of Water Resources was directed to develop a resolution for the Committee's consideration concerning the preferred option for the project (letter attached as Exhibit "G"); and

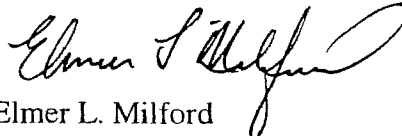
26. The Resources Committee of the Navajo Nation Council, having been fully briefed on the various alternatives for the proposed Navajo-Gallup Water Supply Project, determines that the San Juan River (PNM) Alternative (shown in Map attached as Exhibit "H"), provides the most optimal use of the resources of the Navajo Nation and is in the best interests of the Navajo Nation and its members.

NOW THEREFORE BE IT RESOLVED THAT:

The Resources Committee of the Navajo Nation Council, having been fully briefed on the various alternatives for the proposed Navajo-Gallup Water Supply Project, supports the selection of the San Juan River (PNM) Alternative as the preferred alternative for the Navajo-Gallup Water Supply.

CERTIFICATION

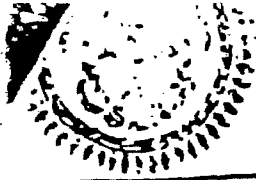
I hereby certify that the foregoing resolution was duly considered by the Resources Committee of the Navajo Nation Council at a duly called meeting at Window Rock, Navajo Nation (Arizona), at which a quorum was present and that same was passed by a vote of 4 in favor, 0 opposed and 0 abstained, this 25th day of March, 2002.



Elmer L. Milford
Chairperson Pro Tem
Resources Committee

Motion: Jack Colorado
Second: Herman Daniels

- Exhibit A March 5, 1992 letter from Marshal Plummer to George Galanis
- Exhibit B February 15, 1996 letter from Wilson Barber to Albert Hale
- Exhibit C April 11, 1997 letter from Albert Hale to Senator Domenici
- Exhibit D Memorandum of Agreement Between the Navajo Nation and the City of Gallup to Cooperate on the Navajo-Gallup Water Supply Project
- Exhibit E August 5, 1998 letter from Milton Bluehouse, Sr. to Senator Domenici
- Exhibit F March 2, 1999 letter from Kelsey Begaye to Senator Domenici
- Exhibit G George Arthur directive
- Exhibit H Map of San Juan River (PNM) Alternative



**NAVAJO
NATION**

P. O. DRAWER 308 • WINDOW ROCK, ARIZONA 86515 • (502) 871-1

**PETERSON ZAH
PRESIDENT**

**MARSHALL PLUMMER
VICE PRESIDENT**

March 5, 1992

George Galanis, Mayor
City of Gallup
P.O. Box 1270
Gallup, New Mexico 87305

RE: Proposed Gallup/Navajo Waterline

Dear Mayor Galanis:

On behalf of the Navajo Nation, please consider this letter as our support for the proposed Gallup/Navajo Water Pipeline. The proposed water pipeline would help to satisfy the basic domestic water needs of our people and the necessary infrastructure for economic development for both the Navajo Nation and the City of Gallup.

The Navajo Nation fully supports this project and intends to actively participate in this initiative. We look forward to a cooperative relationship with you on this mutual concern.

Sincerely,

THE NAVAJO NATION

Marshall Plummer
Vice President

cc: Peterson Zah, President
THE NAVAJO NATION
Charley John, Chief Executive Administrator
OFFICE OF THE PRESIDENT/VICE PRESIDENT



United States Department of the Interior
BUREAU OF INDIAN AFFAIRS

P.O. Box 1060
Gallup, New Mexico 87305

IN REPLY REFER TO:

FEB 15 1996

Mr. Albert A. Hale
President, The Navajo Nation

RE: Request for BIA to Initiate Section 7 Consultation
For Navajo-Gallup Pipeline Project

Dear Mr. Hale:

I am in receipt of your letter requesting BIA to be the lead agency in the Section 7 Consultation with US Fish and Wildlife Service on the Navajo-Gallup Pipeline Project. I am granting this request and I am assigning that task to NIIP. NIIP has the expertise to get the job done and presently has ongoing consultations that will fit nicely with this project. I have instructed them to initiate formal consultation as quickly as possible so as to establish the date of initiation of section 7 consultation.

If you have any questions, please contact Bob Krakow, Project Manager at NIIP at 505-325-1864.

Sincerely,


Area Director



**THE
NAVAJO
NATION**

EXHIBIT C

P.O. Box 9000 • Window Rock, Arizona 86515 • (520) 871-6000

ALBERT A. HALE
PRESIDENT

THOMAS E. ATC
VICE PRESIDE

April 11, 1997

Hon. Pete V. Domenici
United States Senator
SD-427 Dirksen Senate Office Building
Washington, DC 20510-3101

Dear Senator Domenici:

I am writing to express my appreciation for your past support of funding for the Bureau of Reclamation to conduct feasibility studies for the proposed Navajo-Gallup Pipeline. Your support for the continued funding of this project is requested. I understand that Patricia Lundstrum, Executive Director, Northwest New Mexico Council of Governments, will meet with you on April 14, 1997 to discuss this matter and to provide you with a proposed budget for FY'98. In order for this project to continue moving forward, it is necessary that the Bureau receive funding to conduct the preliminary studies that will lead to a successful Section 7 consultation with the U.S. Fish and Wildlife Service. This will require an extensive effort to identify conservation measures that the Service will view as "reasonable and prudent" to offset the anticipated water depletion impacts attributable to the pipeline. It is likely that this effort will require an additional commitment of funding beyond the levels in the proposed budget.

I am also writing to convey support for the continued cooperative efforts of the Navajo Nation and the City of Gallup to make this project a reality. The Navajo Nation is presently preparing a Memorandum of Agreement that protects the Nation's interests in the San Juan River Basin while providing the City of Gallup with adequate assurances of meaningful project participation.

This project would provide a vital supply of water to Navajo communities in northwest New Mexico and to the City of Gallup. As such, I consider this project to be a critical component of the Navajo Nation's water claim in the San Juan River Basin. Accordingly, I have requested Stanley Pollack, the Navajo Nation's water rights counsel, to accompany Ms. Lundstrum at this meeting as my representative.

Sincerely,

THE NAVAJO NATION

A handwritten signature in black ink, appearing to be the name of the representative, written over the printed name of The Navajo Nation.

MEMORANDUM OF AGREEMENT

Between the Navajo Nation and the City of Gallup To Cooperate on the Navajo-Gallup Water Supply Project.

WHEREAS:

1. The Navajo Nation and the City of Gallup have severe water quality and water quantity problems; and
2. During the Congressional Hearings for the proposed Navajo Indian Irrigation Project (NIIP), the New Mexico State Engineer testified that NIIP would be part of the regional water infrastructure intended to provide water from Navajo Dam to Navajo Communities in northwest New Mexico and to the City of Gallup (Hearings before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, S. 3648, July 9 and 10, 1958); and
3. In the 1960's, the Bureau of Reclamation first considered a water pipeline project that would bring water to Navajo Communities in northwest New Mexico and to the City of Gallup, and the Bureau was authorized under Public Law 92-199 (approved December 15, 1971) to conduct feasibility studies for such a project; and
4. In 1984, the Bureau of Reclamation completed a draft Environmental Impact Statement for the proposed Gallup-Navajo Indian Water Supply Project which evaluated three alternative routes for a water pipeline and recommended a route parallel to Highway 666; and
5. Following public hearings in 1984 and 1985, the Navajo Nation recommended reformulation of the project to serve additional communities along Highway 371, and a revised EIS in 1985 supported the recommendation of the route along Highway 371; and
6. By letter of March 5, 1992 from Navajo Nation Vice President Marshall Plummer to Gallup Mayor George Galanis, the Navajo Nation agreed to join the City of Gallup in further discussions to evaluate the project; and
7. In 1992, discussions commenced between technical staff from the Navajo Nation and the City of Gallup to further evaluate the project; and

8. In 1992, Congress authorized \$300,000 for a preliminary reassessment of the project by the Bureau of Reclamation, and in subsequent years, Congress has authorized additional funding to develop a project definition, conduct a biological assessment, and provide an assessment of alternatives; and

9. In 1995, the Navajo Nation entered into Cooperative Agreement No. 5-FC-40-17490 (authorized by RCAU-205-95 and IGRS-190-95) with the Bureau of Reclamation to engage in public meetings and technical studies related to the project; and

10. Seventeen Chapters within the preliminary project area, including Burnham, Becenti, Coyote Canyon, Crownpoint, Dalton Pass, Nageezi, Whitehorse Lake, Mexican Springs, St. Michaels, Tseyatoh, Huerfano, Lake Valley, Pueblo Pintado, Standing Rock, Twin Lakes, Whiterock, Fort Defiance, Tohatchi, and Naschitti have approved continued planning for the project; and

11. By letter of February 15, 1996 Navajo Area Director Wilson Barber, committed the Bureau of Indian Affairs to serve as the lead agency for consultation with the Fish and Wildlife Service concerning compliance with the requirements of the Endangered Species Act, and directed the Bureau of Indian Affairs-Navajo Indian Irrigation Project Office to initiate this consultation as quickly as possible.

NOW, THEREFORE, THE CITY OF GALLUP AND THE NAVAJO NATION AGREE THAT:

1. A cooperative effort by the Navajo Nation and the City of Gallup (the Parties) to proceed with the planning and development of the Navajo-Gallup Water Supply Project is in the best interests of the Parties; and

2. The Parties are committed to a project that will work conjunctively with the Navajo Indian Irrigation Project and will otherwise be developed in a manner that is consistent with the water rights of the parties; and

3. The Parties are committed to a project that will result in a fair and equitable distribution of project water between the City of Gallup and the Navajo communities; and

4. The Parties are committed to cooperatively investigate all viable alternative project configurations, including a pipeline from the San Juan River; and

5. In order to ensure that the project will be in compliance with the requirements of the Endangered Species Act, the Parties support commitment of the Bureau of Indian Affairs to engage in consultation with the Fish and Wildlife Service as quickly as possible; and

6. The Parties will work together to resolve issues affecting the implementation of the Project; and

7. The planning efforts between the Navajo Nation and the City of Gallup will be voluntary and are without prejudice to any position either party may assert in the San Juan River General Stream Adjudication, or in any other matter concerning the water resources of the Parties.

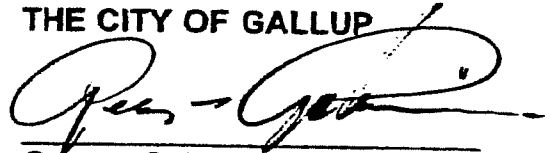
This Memorandum of Agreement was executed on this 17th day of April, 1998.

THE NAVAJO NATION



Thomas E. Atsitty, President

THE CITY OF GALLUP



George Galanis, Mayor



THE NAVAJO NATION

EXHIBIT E

P.O. Box 9000 • WINDOW ROCK, ARIZONA 86515 • (520) 871-60

MILTON BLUEHOUSE, SR.
PRESIDENT

AUG - 5 1998

The Honorable Pete V. Domenici
328 Hart Senate Office Building
Washington, DC 20510-3101

RE: Navajo-Gallup Water Supply Project

Dear Senator Domenici:

The Navajo Nation appreciates your past and continued support for the Navajo-Gallup Water Supply Project. I am writing to request your support to maintain the full level of funding for this project when the Senate-House Conference considers the FY 1999 Energy and Water Development Appropriation bill. The Senate recommended \$150,000 but the House zeroed out the funding for this project.

The Navajo-Gallup Water Supply Project, when complete, will deliver water to the City of Gallup and to Navajo communities in northwest New Mexico primarily for municipal, domestic and commercial uses. The proposed project is designed to meet most of the projected regional water demands through the year 2040. The project design is now sufficiently developed to enable the Bureau of Indian Affairs to commence formal consultation with the U.S. Fish and Wildlife Service concerning possible impacts on endangered species. It is anticipated that the Service will require "reasonable and prudent alternatives" to be developed to mitigate the impacts on endangered fish resulting from river depletions attributable to the project. The FY 1999 funds will support the efforts of the parties to evaluate appropriate mitigation measures so that the consultation will be a success. Any reduction in funding for the project will seriously hinder and delay our efforts to satisfy the necessary environmental compliance requirements.

You should be aware that the Navajo Nation, the City of Gallup, the Northwest New Mexico Council of Governments, the Bureaus of Indian Affairs and Reclamation, together with Navajo Agricultural Products Industry, have continued their efforts to develop alternative project configurations that will satisfy the requirements of the Endangered Species Act. This past April, President Atcity and Mayor Galanis executed a Memorandum of Agreement on behalf of the Navajo Nation and the City of Gallup to formalize the collaborative effort between the project beneficiaries. Notwithstanding past and possible future changes in the administration in Window Rock, you can be assured that the Navajo Nation is committed to this project.

Senator Pete V. Domenici
RE: Navajo-Gallup Water Supply Project
Page 2

Once again, thank you for your commitment to and continued support for this project. We look forward to working with you to make this project a reality.

Sincerely,

THE NAVAJO NATION

A handwritten signature in black ink, appearing to read "Milton Bluehouse, Sr.", with a stylized flourish at the end.

Milton Bluehouse, Sr.
President



**THE
NAVAJO
NATION**

EXHIBIT F

P.O. Box 9000 • WINDOW ROCK, ARIZONA 86515 • (520) 871-6

KELSEY A. BEGAYE
PRESIDENT

TAYLOR MCKEN
VICE

March 2, 1999

The Honorable Pete V. Domenici
328 Hart Senate Office Building
Washington, DC 20510-3101

RE: Navajo-Gallup Water Supply Project

Dear Senator Domenici:

By letter of August 5, 1998, my predecessor, President Milton Bluehouse, affirmed the commitment of the Navajo Nation to and our appreciation for your past support of the Navajo-Gallup Water Supply Project. By this letter, I am writing to reaffirm our commitment to this project and to once again request your support to ensure the funding levels necessary to keep this project viable.

The Northwest New Mexico Council of Governments (COG) has been instrumental in keeping this project on-track and has helped to facilitate a greater dialogue between the Navajo Nation and the City of Gallup. The COG has drafted a Legislative Proposal to establish a line item in the Bureau of Reclamation's budget to fund the completion of the Final Plan Report for this project and to complete the necessary NEPA and Endangered Species Act compliance activities. The COG is requesting \$300,000 in FY 2000 and \$450,000 in FY 2001 for the Bureau.

Please consider this letter as an expression of the Navajo Nation's support for the COG's Legislative Proposal. Once again, we ask for your continued support for and commitment to this project. We look forward to working with you to make this project a reality.

Sincerely,

THE NAVAJO NATION

A handwritten signature in black ink, appearing to read "KAB", followed by a long horizontal flourish.

Kelsey A. Begaye
President

The Legislative Branch
The Navajo Nation

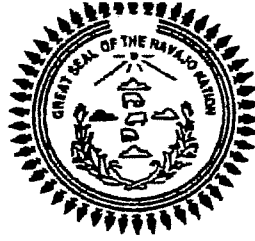


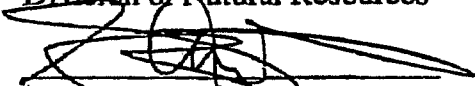
EXHIBIT G

Edward T. .
Speaker of the Navajo Nation C

MEMORANDUM

TO : Arvin Trujillo, Executive Director
Division of Natural Resources

Johnnie Francis, Director
Department of Water Resources
Division of Natural Resources

FROM : 
George Arthur, Chairman
Resources Committee

DATE : February 12, 2002

SUBJECT : Directive – Navajo Gallup Water Supply Project

Handwritten: J. Francis 2/19/02

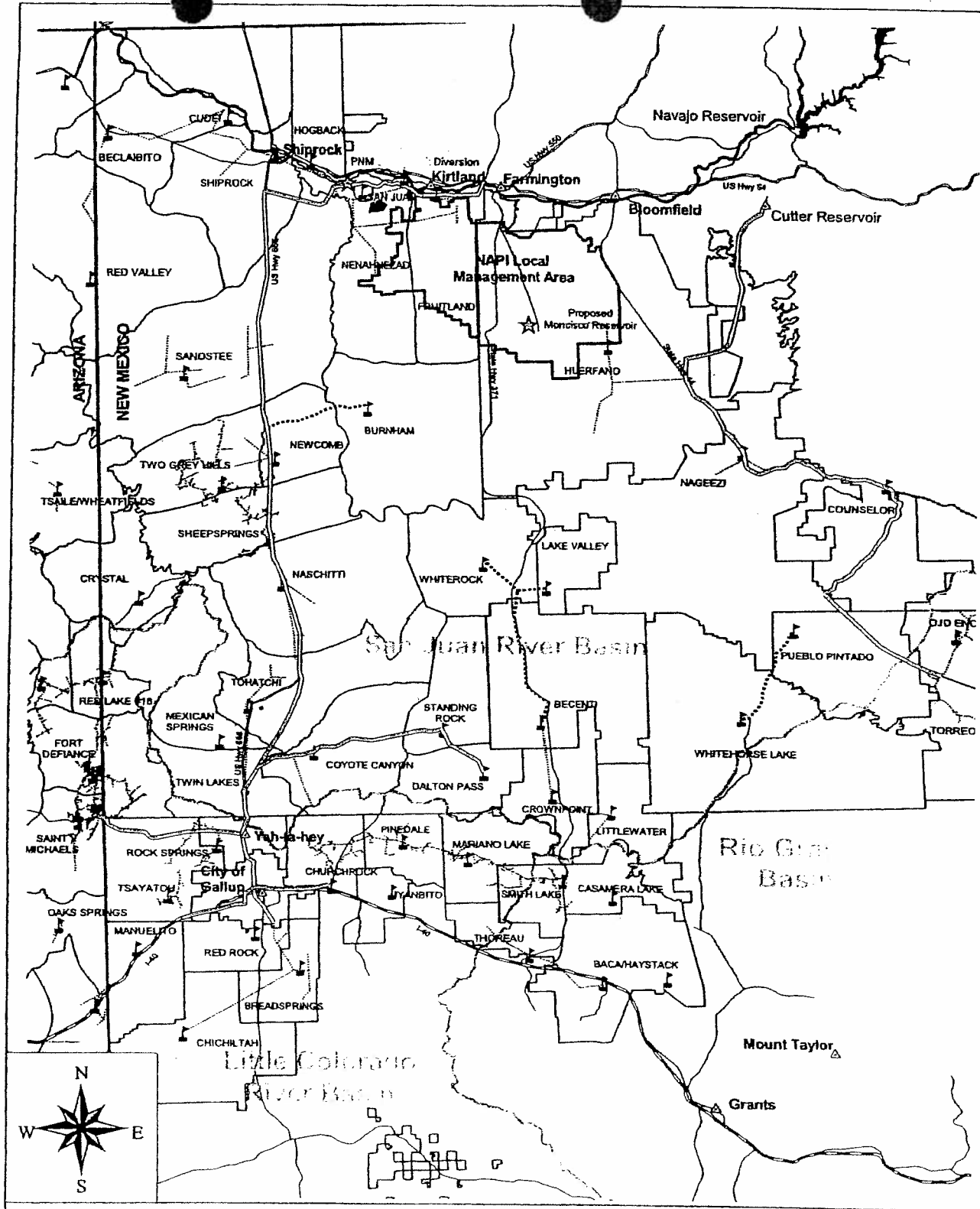


The Resources Committee at their meeting held on January 22, 2002, directed the Department of Water Resources to develop a position statement concerning the preferred option for the Project along with a resolution for the Committee's consideration. Please provide the resolution for the Committee's consideration at their first regular meeting on March 14, 2002.

This directive was issued in response to concerns raised by Committee members when the Water Resources staff presented their report to the Committee. Thank you for your immediate attention to this matter.

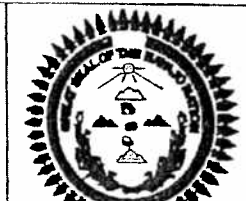
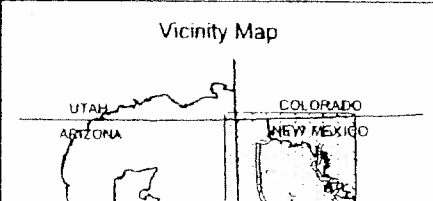
Members, Resources Committee

EXHIBIT H



Legend

- SJR Alt. Main
- SJR Alt. Programmatic
- Chapter Houses
- Towns
- Farmington-Shiprock Pipeline



Navajo - Gallup Water Supply Project

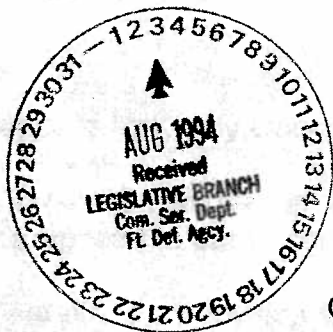
Navajo Nation
 Department of Water Resources
 P.O. Drawer 678
 Fort Defiance, Arizona 86505



ATTACHMENT D

Resolutions of the Navajo Nation
Chapters

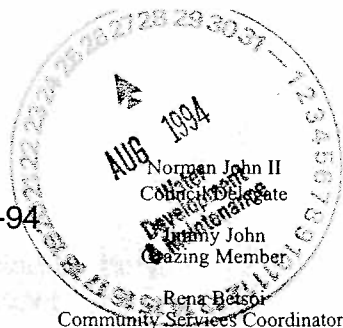
Randolph Lee
President
Sallie Ann Begay
Vice-President
Harry H. Yazzie
Secretary/Treasurer



Twin Lakes Chapter

Fort Defiance Agency
District 14
P.O. Box 4424
Yahtahey, N.M. 87375
(505) 735-8874/2363

TLC-07-035-94



**RESOLUTION
OF THE TWIN LAKES CHAPTER**

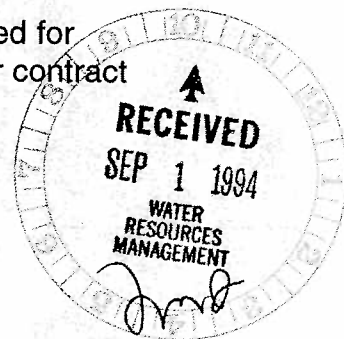
**REQUESTING THE NAVAJO NATION, RESOURCES COMMITTEE, DIVISION OF
NATURAL RESOURCES AND WATER RESOURCES MANAGEMENT OFFICE TO
CONTINUE THE PRELIMINARY PLANNING OF THE PROPOSED NAVAJO WATER
SUPPLY PROJECT**

WHEREAS:

1. Twin Lakes Chapter is a duly certified Chapter of the Navajo Nation government with vested authority to make local ordinances and to approve plans and take positions on matters of local concerns that are in the best interest of the local chapter and the Navajo Nation; and
2. The Navajo Nation Water Resources Management Office is conducting requisite studies for the proposed water supply project; and
3. Twin Lakes Chapter is one of the community identified to be served by the proposed water supply project; and

NOW, THEREFORE, BE IT RESOLVED THAT:

1. Twin Lakes Chapter hereby requests the Navajo Nation, Resources Committee, Division of natural Resources Management Office to continue the Preliminary Planning of the proposed Navajo Water Supply Project with the following recommendations:
 - a. The Navajo Nation through the Resources Committee is designated the lead sponsor of the proposed water supply project.
 - b. That the delivery of irrigation water be included for the Twin Lakes Community.
 - c. That additional allocation of water for future expansion be planned for Twin Lakes Community.
 - d. That planning and proposal be developed for the delivery of water for commercial development.
 - e. That the Navajo Nation retains its ownership of all water rights proposed for delivery by the Project and that negotiation be initiated to enter into a water contract with the City of Gallup for a term of 5 to 10 years option of 10yrs, renewal.



Gallup and McKinley County relating to land use matters.

g. That the City of Gallup and McKinley County provide a plan of operation on how they proposed to put to beneficial use of the water from the proposed Project.

h. That plans be develop for evaluation and implementation for no users charge system to Navajo communities similar to the system developed on the Sioux Reservation in the Mini Wiconi water project. As reported the federal government is provideng grant funds for the construction of the pipeline and associated infrastructures; however, the Navajo Nation retains full water rights.

l. That the Twin Lakes Chapter will consider a follow-up resolution when these recommendations have been expedited by the appropriate office.

m. That the Twin Lakes Chapter will appoint 2 representatives for recommendations.

WE HEREBY certify that the foregoing Resolution was duly considered by the Twin Lakes Chapter at a duly called meeting at Twin Lakes, New Mexico, at which a quorum was present, and that the same was motioned by Tom Begay and seconded by Edward King and was adopted by 49 in favor and 0 opposed, this 17th day of July 1994.

Randolph Lee

Randolph Lee, Chapter President

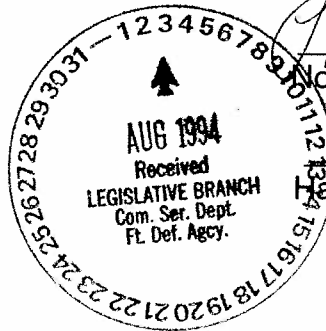
Norman John

Norman John, Council Delegate

Sallie Ann Begay, Vice President

Harry H. Yazzie, Sec./ Treas.

Jimmy P. John, Grazing Committee





THE NAVAJO NATION

P.O. BOX 308 • WINDOW ROCK, ARIZONA 86515 • (602) 871-4941

PETERSON ZAH
PRESIDENT

RESOLUTION OF LAKE VALLEY CHAPTER

MARSHALL PLUMMER
VICE PRESIDENT

SUPPORTING CONTINUED PLANNING FOR THE NAVAJO/GALLUP WATER SUPPLY PROJECT

WHEREAS:


1. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the eastern Navajo Nation, the City of Gallup and the Navajo communities in the Window Rock area; and
2. The Lake Valley Chapter is one of the communities to be served by the Navajo/Gallup Water Supply project; and
3. The Navajo Nation is designed to become the lead sponsor of the Navajo/Gallup Water Supply Project.

NOW BE IT THEREFORE THAT:

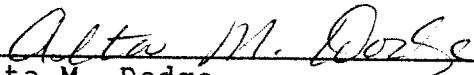
1. The Lake Valley Chapter of the Navajo Nation requests that the Navajo Public be fully involved in the planning of this important project.
2. The Lake Valley Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

C E R T I F I C A T I O N

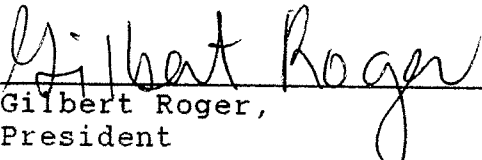
We certify that the foregoing resolution was duly considered by the Lake Valley Chapter at a duly called chapter meeting at Lake Valley, New Mexico, at which quorum was present and that the same was passed by a vote of 50 in favor and None opposed on the 21st day of February 1994.



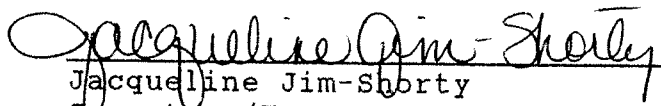
Herbert J. Pioche,
Council Delegate



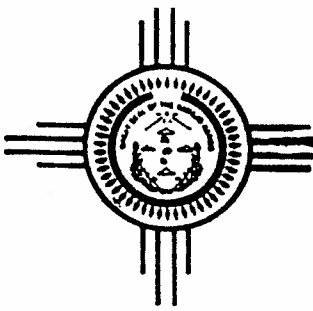
Alta M. Dodge,
Vice President



Gilbert Roger,
President



Jacqueline Jim-Shorty
Secretary/Treasurer



MEXICAN SPRINGS CHAPTER

P. O. BOX 93 • MEXICAN SPRINGS, NEW MEXICO 87320 • (505) 733-2341

RESOLUTION

SUPPORTING CONTINUED PLANNING FOR THE NAVAJO/GALLUP WATER SUPPLY PROJECT.

MXS-01-002-94

WHEREAS:

1. The Mexican Springs Chapter is a certified chapter of the Navajo Nation, empowered to consider all community concerns and matter; and
2. Water is necessary for the future growth of the Mexican Springs community; and
3. The Mexican Springs Chapter is designated to be served by the Navajo/Gallup Water Supply Project.

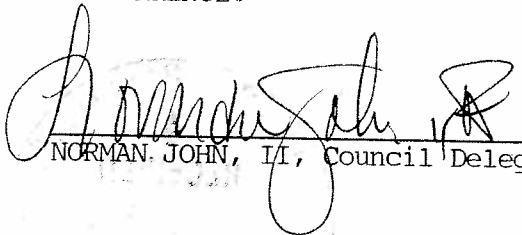
NOW THEREFORE BE IT RESOLVED THAT:

1. The Mexican Springs Chapter of the Navajo Nation supports continued planning for the Navajo/Gallup Water Supply Project.
2. The Navajo Public will be fully involved in the planning of the Navajo/Gallup Water Supply Project.
3. The Mexican Springs Chapter further requests to the Water Development Department to keep the community of Mexican Springs abreast on this said project.


C E R T I F I C A T I O N

I hereby certify that the foregoing resolution was duly considered by the Mexican Springs Chapter at a duly called meeting at Mexican Springs, Navajo Nation, (New Mexico), at which a quorum was present and that same was passed by a motion made by MANUEL SHIRLESON and seconded by JULIUS BAHE, and a vote of 46 in favor, 0 opposed, and 0 abstained, this 9th day of JANUARY, 1994.

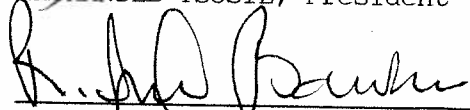
CONCURRENCE:



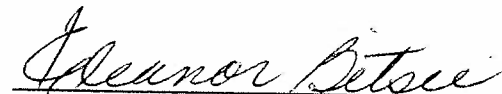
 NORMAN JOHN, II, Council Delegate



 NATHANIEL TSOSIE, President



 RICHARD BOWMAN, Vice President



 ELEANOR BITSIE, Secretary/Treas.

nt:cs

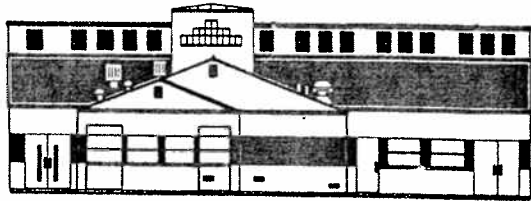
RECEIVED

Huerfano Chapter .. 91

10277

MAR 30 1994

Peterson Zah-President
COMMUNITY SERVICE PROG
ASTORIA NAVAJO AGENCY
COUNCIL SPEAKER



APR 20 1994
P. O. BOX 968
BLOOMFIELD, NEW MEXICO 87413
(505) 325-1400
(505) 325-0140

RESOLUTION OF HUERFANO CHAPTER

SUBJECT: REQUESTING THE NAVAJO NATION AND CITY OF GALLUP TO ALLOW TO CREATE GALLEGOS RESERVOIR WITHIN THE HUERFANO CHAPTER JURISDICTION AREA ON CONDITIONS THAT CERTAIN REQUESTS MADE OF NAPI AND RESOURCES COMMITTEE BE MADE OBLIGED IN ORDER TO ASSURE THAT AFFECTED NAVAJO CITIZENS BE COMPLETELY SATISFIED WITH THE OUTCOME OF THE NAVAJO-GALLUP WATERLINE PROJECT.

WHEREAS:

1. Huerfano Chapter is a locally recognized and certified government under the laws guidelines of the Navajo Nation and is given responsibility to seek various remedies and solutions to problems affecting its Navajo Citizens residing in the largest chapter land area of Eastern Navajo Agency; and,
2. Huerfano Chapter is actively aware that a waterline will be extended from an area of NAPI, which is in jurisdiction of Huerfano Chapter, where a reservoir will be built and this proposed waterline project will go into the city of Gallup and along the path of the project all chapters adjacent to the line will be given the process of obtaining domestic water including Huerfano Chapter area; and,
3. Huerfano Chapter is aware that when NAPI took over the farming area, many Navajo Citizen relocates were not given proper and adequate compensation for their removal where a few housing units were built at their new relocated areas, but presently the housing units were built in substandard approach are in state of shambles where seams are splitting up needing urgent repair; and,
4. Huerfano Chapter is aware that NAPI was properly asked to build more watering point on its outskirts of its farming area in order to provide water to the Navajo Citizens owning livestock, but the request was never issued a proper response indicating that local citizens are not the important segment of society; and,
5. Huerfano Chapter is aware that NAPI developed a registration of all Navajo Citizens using the NAPI water because it was stated that the water should be used for livestock only and in respectful response the chapter issued a resolution stating that the water should be used for many immediate needs, but again there was no feedback; and,
6. Huerfano Chapter is aware, through contact and communication, that NAPI has hauled some water to some windmill tanks during drought season charging for the export to the chapter account and at the same time NAPI used chemically infested watertrucks delivering pesticide-infested water to the citizens indicating that Navajo Citizens should be given any quality of water; and,
7. Huerfano Chapter is aware that during the peak of the farming season many Navajo Citizens and Mexican Immigrants come to NAPI to work where they infringed on the rights of homesite living and grazing areas by developing homesites with shades and tents thus causing some frictions; and,

ANDREW SIMPSON
Council Delegate

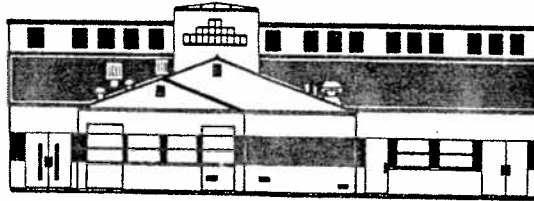
WILSON RAY
President

FRANK P. BLACKIE
Vice President

BOBBY TSOSIE
Secretary-Treasurer

Huerfano Chapter . 91

Peterson Zah-President
Marshal Plummer-Vice President
Nelson Gorman-Council Speaker



P. O. BOX 968
BLOOMFIELD, NEW MEXICO 87413
(505) 325-1400
(505) 325-0140

Navajo-Gallup Waterline Project
Page two

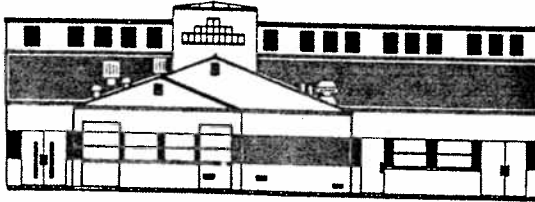
7. Huerfano Chapter is aware that NAPI, since its establishment, has been involved with the use of dangerous chemicals for pesticide and fertilizer in controlling the pests and enriching the soil for farming where there are reports that the water tables beneath the farming areas as well as adjacent lands are chemically infested unsuitable for human consumption and use and at the same time release of unused water back to the San Juan River travels through populated areas; and,
8. Huerfano Chapter is making awareness of existing problems in order that the new proposed reservoir and waterline project will not go through the same rut causing more additional problems for the chapter and its Navajo Citizens.

NOW, THEREFORE BE IT RESOLVED THAT:

1. Huerfano Chapter is requesting that certain amount of appropriation be directly earmarked for repair and new housing units for the past relocatees as well as the relocatee-to-be's coming out of proposed Gallegos Reservoir in adequate sum where there will not be negative feedback later in years; and,
2. Huerfano Chapter is requesting that all repair on the former housing units and the new housing units be done by qualified and certified housing contractors to assure the units will be longlast as the ones in urban areas; and,
3. Huerfano Chapter is diligently requesting that a large waterline be built and be extended to the eastern boundary of the chapter where all Navajo Citizens, including Blanco Canyon, Dzilhnaothle, Adobe, Bisti, Gallegos, Carson, Huerfano, and other communities within the chapter area, will be given domestic water and also water for their daily and for livestock; and,
4. Huerfano Chapter is requesting that during the drought season, NAPI should help the affected Navajo livestock owners with waterhauling when their requests for such activity is made, not causing any negative feedback such as reimbursement; and,
5. Huerfano Chapter is requesting that proper clean water not chemically infested be made available to the Navajo Citizens in a manner that further health damages to citizens and animals not be wholly allowed; and,
6. Huerfano Chapter is requesting that NAPI established some living quarters within its farming area so all immigrant workers may have a descent place to live eliminating barging on the grazing area and living area of Huerfano Chapter citizens; and,
7. Huerfano Chapter is requesting the Navajo Nation, City of Gallup, and Bureau of Reclamation to act accordingly by establishing an escrow account which will be used to repair housing units for the past NAPI Relocatees; new relocatees; and to extend the further escrow funds to be used for certain unmet present needs

Huerfano Chapter . 91

Peterson Zah-President
Marshal Plummer-Vice President
Nelson Gorman-Council Speaker



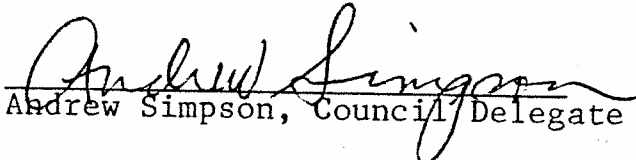
P. O. BOX 968
BLOOMFIELD, NEW MEXICO 87413
(505) 325-1400
(505) 325-0140

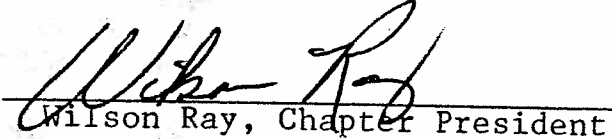
Navajo-Gallup Waterline Project
Page three

- causing therefore full obligation for the future; and,
7. Huerfano Chapter is requesting that further use of pesticide and fertilizers on NAPI farming areas be further eliminated and to start using nature-producing pesticide and fertilizers to assure that local citizens and livestock not to be infested with cancerous disease in the near future; and,
 8. Huerfano Chapter of the Navajo Nation requests that the Navajo Citizens be fully involved in the planning of the project; and,
 9. Huerfano Chapter of the Navajo Nation supports the actions necessary to plan and build the Navajo-Gallup Waterline Project.

C E R T I F I C A T I O N

IT IS CERTIFIED THAT THE FOREGOING RESOLUTION WAS DULY CONSIDERED BY AND MOVED FOR ADOPTION BY PAULINE McCAULEY, SECONDED BY ETTA ARVISO, THOROUGHLY DISCUSSED AND ADOPTED BY A VOTE OF 36 IN FAVOR, AND 0 OPPOSING AT A DULY CALLED MEETING AT HUERFANO CHAPTER, ON THIS 13TH DAY OF FEBRUARY, 1994.


Andrew Simpson, Council Delegate


Wilson Ray, Chapter President


Frank Blackie, Vice-President


Bobby Tsosie, Secretary/Treasurer

RECEIVED

MAR 30 1994

COMMUNITY SERVICE PROG.
EASTERN NAVAJO AGENCY
WATR-5600

R E S O L U T I O N O F
T H E F O R T D E F I A N C E C H A P T E R

SUPPORTING THE REQUEST OF A COMPLETE FEASIBILITY STUDY OF THE
NAVAJO-GALLUP WATER SUPPLY PROJECT

WHEREAS:

1. The Fort Defiance Chapter is a duly certified chapter of the Navajo Nation, which serves as a local governmental autonomy of the community of the Navajo people; and

2. The Fort Defiance Chapter has the authority to address local, state, national and federal issues that may affect their lifestyles; and

3. The proposed Navajo-Gallup Water Project may provide for future needs of treated water for domestic and commercial uses to the Fort Defiance Community; and

4. The Fort Defiance desires a complete feasibility study of the Navajo-Gallup Water Supply Project in order to consider the beneficial components of the project to the Fort Defiance community and the Navajo people.

NOW, THEREFORE; BE IT RESOLVED THAT:

The Fort Defiance Chapter; hereby, support and request a complete feasibility study of the Navajo-Gallup Water Supply Project.

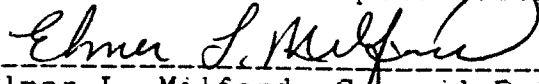
MOTIONED BY: Dennis Williams

SECONDED BY: Katherine Hillis

C E R T I F I C A T I O N

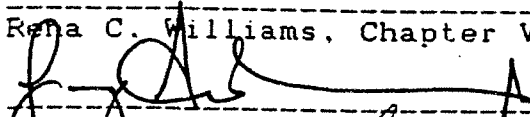
WE, HEREBY certify that the foregoing resolution was duly considered by the Fort Defiance Chapter at a duly called meeting on December 5, 1993 where a quorum was present and that same was adopted by a vote of 43 in favor, 0 opposed and 0 abstained.

Jimmie Bitsuie, Chapter President

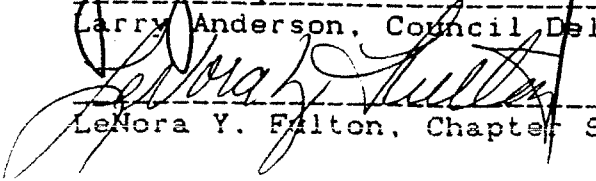


Elmer L. Milford, Council Delegate

Rena C. Williams, Chapter Vice President



Larry Anderson, Council Delegate



LeNora Y. Filton, Chapter Secretary/Treasury



NAHODISHGISH CHAPTER

P.O. BOX 369
CROWNPOINT, NEW MEXICO 87313
(505) 786-5858

NAHO-FEB-21-94

RESOLUTION OF THE NAHODISHGISH CHAPTER OF THE NAVAJO NATION

SUBJECT: SUPPORTING CONTINUED PLANNING FOR THE NAVAJO/GALLUP WATER SUPPLY PROJECT.


- WHEREAS:
1. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the Eastern Navajo Nation, the City of Gallup, and communities in the Window Rock, area; and,
 2. The Nahodishgish Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and,
 3. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.

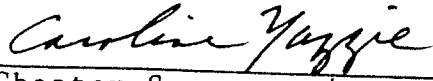
NOW THEREFORE IT BE RESOLVED THAT:

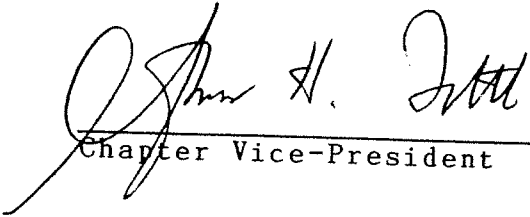
1. The Nahodishgish Chapter of the Navajo Nation request that the Navajo public be fully involved in the planning of this important project; and,
2. The Nahodishgish Chapter of the Navajo Nation supports the actions necessary to plan the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

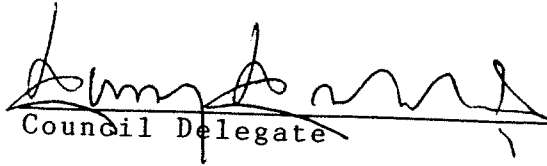
C E R T I F I C A T I O N

We certify that the foregoing resolution was approved by a vote of 28 in favor, 0 opposed, and 0 abstaining, this 13th day of February 1994, at a duly called meeting of the Nahodishgish Chapter at which a quorum was present.


Chapter President


Chapter Secretary/Treasure


Chapter Vice-President


Council Delegate

RESOLUTION OF THE
BURNHAM CHAPTER OF THE NAVAJO NATION

Supporting Continued Planning for
the Navajo/Gallup Water Supply Project

WHEREAS:

1. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the Eastern Navajo Nation, the City of Gallup, and communities in the Window Rock area; and,

2. The Burnham Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and,

3. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.


NOW BE IT THEREFORE RESOLVED THAT:

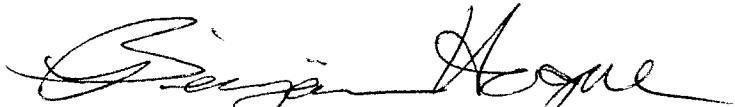
1. The Burnham Chapter of the Navajo Nation requests that the Navajo public be fully involved in the planning of this important project; and,


2. The Burnham Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

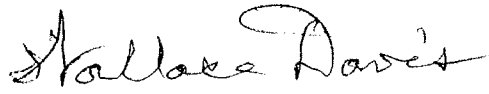
CERTIFICATION

We certify that the foregoing resolution was approved by a vote of 47 in favor, 00 opposed, and 00 abstaining, this 24th day of January, 1994, at a duly called meeting of the Burnham Chapter at which a quorum was present.


Allen Gleason, President
Burnham Chapter


Benjamin Hogue, Vice President
Burnham Chapter


Lorraine Bigman, Secretary
Burnham Chapter



Motion: Molly Hogue
Second: RAY YAZZIE

HARRY HUBBARD

Council Delegate

JOHN PERRY, JR.

President School

JOHNSON CRAIG

Vice Pres

FRAN FREELAND

Secretary Treasurer



LINCOLN PERRY JR

Land Board School Board Member

ALICE BENAL

School Board Member

ELEN JAKE

Community Service Coordinator

EXHIBIT

A

CROWNPOINT CHAPTER

P.O. BOX 336 CROWNPOINT, NEW MEXICO 87313 505-786-5639

RESOLUTION OF CROWNPOINT CHAPTER

CP-94-02-221

SUBJECT: SUPPORTING CONTINUED PLANNING FOR THE NAVAJO/GALLUP WATER SUPPLY PROJECT

WHEREAS:

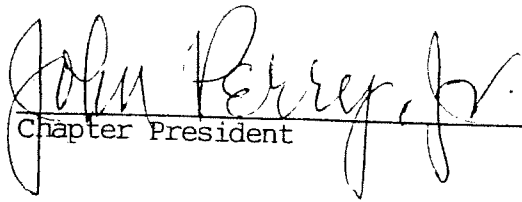
1. The Crownpoint Chapter is a certified Chapter of the Navajo Nation Government and is vested with the authority to address the needs and concerns of the people it serves and to address issues related to its local government; and
2. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the Eastern Navajo Nation, the City of Gallup, and communities in the Window Rock area; and
3. The Crownpoint Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and
4. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.

NOW THEREFORE BE IT RESOLVED THAT:

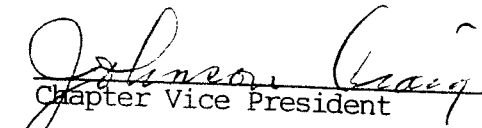
1. The Crownpoint Chapter of the Navajo Nation requests that the Navajo public be fully involved in the planning of this important project; and
2. The Crownpoint Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

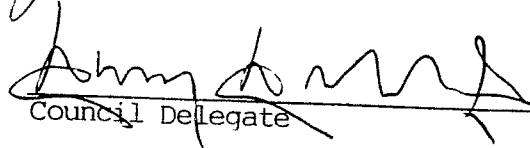
C E R T I F I C A T I O N

WE HEREBY CERTIFY that the foregoing resolution was duly considered by the Crownpoint Chapter at a duly called meeting at Crownpoint, Navajo Nation (New Mexico), at which a quorum was present and motion was made by Rosemary Silversmith, second by Helen White and that same was passed by a vote of 38 in favor and 1 opposed, 0 abstaining, this 13th day of February, 1994.


Chapter President


Chapter Secretary/Treasure


Chapter Vice President


Council Delegate



COYOTE CANYON CHAPTER • P.O. Box 257 • Brimhall, New Mexico 87310 • (505) 735-2204

CECIL SYLVERSMYTHE
COUNCIL DELEGATE

JAMES BLACKGOAT
PRESIDENT

IRENE S. BITSUI
SECRETARY/TREASURER

CAROLE TOM
COUNCIL DELEGATE

HARRISON PLUMMER
VICE PRESIDENT

GEORGE B. TSO
GRAZING COMMITTEE

COY12-084-93

RESOLUTION OF THE COYOTE CANYON CHAPTER
SUPPORTING THE NAVAJO/GALLUP WATER PROJECT:

WHEREAS:

1. The Coyote Canyon Chapter is a duly certified Chapter of the Navajo Nation is authorized by the Navajo Tribal Council to review, enact on needs affecting the community and make recommendations; and
2. The proposed Navajo/Gallup Water Supply Project will provide for future needs of treated water for domestic and commercial uses to Coyote Canyon Chapter.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Coyote Canyon Chapter of the Navajo Nation supports actions necessary to realize construction of the Gallup/Navajo Water Supply Project scheduled to serve water needs of the Coyote Canyon Chapter area; and,
2. The Coyote Canyon Chapter of the Navajo Nation requests full public participation in the planning of the Navajo/Gallup Water Supply Project.

C E R T I F I C A T I O N

We hereby certify the foregoing resolution was duly considered by Coyote Canyon Chapter at a duly called meeting at Coyote Canyon, Navajo Nation (New Mexico) at which a quorum was present and same was passed by a vote 39 in favor, 00 opposed, and 00 abstained, this 12th day of December, 1993.

"HOME OF CHIEF MANUELITO"

Hastiin Ch'ilhaajiinée

Cecil Sylversmythe
Cecil Sylversmythe, Council Delegate
Coyote Canyon Chapter

Carole Tom
Carole Tom, Council Delegate
Coyote Canyon Chapter

James Blackgoat
James Blackgoat, President
Coyote Canyon Chapter

Harrison Plummer
Harrison Plummer, Vice President
Coyote Canyon Chapter

Irene S. Bitsui
Irene Bitsui, Secretary Treasurer
Coyote Canyon Chapter

Tom B. Becenti
President

Thelma P. Francisco
Vice-President

Margorie Lantana
Secretary/Treasurer

THE NAVAJO NATION

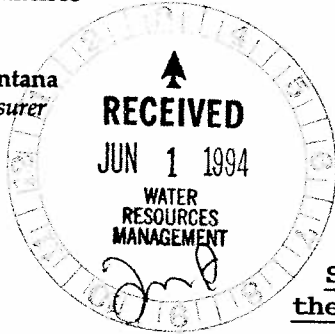
T'lo dii tsin
Becenti Chapter
P.O. Box 708
505-786-7242

Crownpoint, New Mexico 87313

Harry Hubbard
Council Delegate

Lucy Cayatineto
Land Board

Leonard A. McCauley
Chapter Coord./Crownpoint Sch. Board



RESOLUTION OF BECENTI CHAPTER THE NAVAJO NATION

BEC-94-0401

May 27 1994
W.R.M. please
Respond w/cor
sent to DWK

Supporting Continued Planning for the Navajo/Gallup Water Supply Project

WHEREAS:

1. The Becenti Chapter as an entity of the Navajo Nation given the authority to approve community issues for the benefit of its community; and
2. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the Eastern Navajo Nation, the city of Gallup, and communities in the Window Rock area; and
3. The Becenti Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and
4. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Becenti Chapter of the Navajo Nation requests that the Navajo public be fully involved in the planning of this important project; and
2. The Becenti Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

CERTIFICATION

WE HEREBY CERTIFY THAT THE FOREGOING RESOLUTION WAS DULY CONSIDERED by the Becenti Chapter of the Navajo Nation at a duly called meeting at Becenti, Navajo Nation (New Mexico), at which a quorum was present and that same was motioned by Loretta C. Benally and seconded by Tom Shorty and was adopted by 34 in favor and 01 opposed, this 10th day of April, 1994.

CHAPTER PRESIDENT - TOM B. BECENTI

COUNCIL DELEGATE - HARRY HUBBARD

CHAPTER VICE PRESIDENT -
THELMA P. FRANCISCO

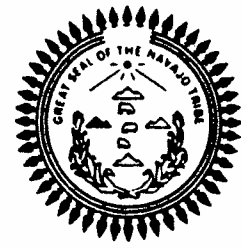
CHAPTER SECRETARY/TREASURER -
MARGORIE LANTANA



MAY 05 1994



NAVAJO NATION



94-03-0049-SHIP

RESOLUTION OF THE SHIPROCK CHAPTER

CHAPTER OFFICERS

William Lee
President

David C. Curley
Vice President

Lula Jackson
Secretary / Treasurer

TRIBAL COUNCIL DELEGATES

Wallace Charley
Genevieve Jackson
William Tso

Duane "Chilli" Yazzele

AGRICULTURE OFFICERS

David Burbank
Grazing Committee

Robert Hayes
Landboard Member

SUPPORTING RESOLUTION TO REQUEST THE NAVAJO NATION NAVAJO WATER RESOURCES MANAGEMENT TO CONDUCT PUBLIC HEARINGS IN ALL THE NAVAJO NATION CHAPTERS WHO UTILIZE THE SAN JUAN RIVER.

WHEREAS:

1. The Shiprock Chapter pursuant to the authority contained in Section 1, Subsection (C) of Tribal Council Resolution # W-20-55 which certified Shiprock Chapter as a recognized Chapter of the Navajo Nation and is authorized to conduct business of a local government; and
2. The purpose of the Navajo Nation Chapters is to provide a forum in which local needs may be addressed and concerns of the Navajo Nation as a whole may be explored and considered by each constituent part of the Navajo Nation; and
3. The Navajo Tribal Council enacted legislation (CD-86-57) implying that Navajo Reservation water be sufficient for development of an agricultural economy on "arid" lands within a reduced Indian reservation; and
4. The U.S. Congress has enacted special legislation authorizing the construction of the Navajo Indian Irrigation Project, providing always that Indians shall be supplied with water from the Navajo Indian Irrigation Project; and
5. The Navajo Water Resources Management Department will be holding public hearings at Crownpoint, Navajo Nation (NM) on March 25, 1994; and
6. The second Navajo Nation public hearing conducted by the Navajo Water Resources Management Department will be held at Twin Lakes, Navajo Nation (NM) on March 27, 1994.

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The Shiprock Chapter as a distinct, dependent, political community requests that the Navajo Water Resources Management Department conduct public hearings in Navajo Nation Chapter located near and that are utilizing the San Juan River.
2. The Shiprock Chapter respectfully requests the Navajo Nation appropriate the necessary funds to conduct a scheduled public hearing in the Shiprock Chapter House in order for the Navajo public to hear and examine the proposed Navajo-Gallup Water Supply Line in more detail.

RECEIVED NAVAJO
OFFICIAL COPY

FEB 05 '09

CLASS	34		
SENDER			
PROJECT			
CONTROL #			
NAME	DATE	INITIAL	CYS
Spencer			

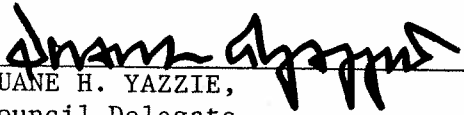
RESOLUTION OF THE
SHIPROCK CHAPTER
RESOL. NO. 94-03-0049--SHIP
PAGE 02 of 02

C E R T I F I C A T I O N

We, the undersigned, certify that the above resolution was present and thoroughly discussed at a duly called chapter meeting, at which a quorum was present, and the same was approved by a vote of 60 in favor; 00 opposed with 00 abstention on this 20th day of March, 1994.



WILLIAM LEE, President

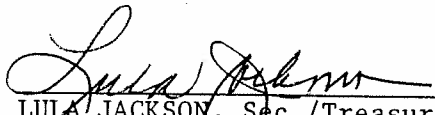


DUANE H. YAZZIE,
Council Delegate



DAVID C. CURLEY, Vice-Pres.

WILLIAM TSO,
Council Delegate



LULA JACKSON, Sec./Treasurer

GENEVIEVE JACKSON,
Council Delegate

WALLACE CHARLEY,
Council Delegate





LITTLEWATER CHAPTER

P.O. BOX 1898
CROWNPOINT, NEW MEXICO 87313
(505) 786-5488
RESOLUTION

LITT-94-02-0157
[Handwritten signature]

OF
THE LITTLEWATER CHAPTER OF THE NAVAJO NATION

SUPPORTING CONTINUED PLANNING FOR THE NAVAJO/GALLUP WATER SUPPLY PROJECT

WHEREAS:

1. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the Eastern Navajo Nation, the City of Gallup, and communities in the Window Rock area; and
2. The Littlewater Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and
3. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.

NOW BE IT THEREFORE RESOLVED THAT:

1. The Littlewater Chapter of the Navajo Nation requests that the water pipeline plans be changed to include a lateral to the Littlewater Community; and
2. The Littlewater Chapter of the Navajo Nation requests that the Navajo public be fully involved in the planning of this important project; and
3. The Littlewater Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

CERTIFICATION

WE HEREBY CERTIFY THAT THE FOREGOING RESOLUTION was approved by a vote of 28 in favor, 0 opposed, and 0 abstaining, this 14TH day of January, 1994, at a duly called meeting at the Littlewater Chapter at which a quorum was present.

[Signature of Paul D. Jones]
Paul D. Jones, Council Delegate

[Signature of Bennie Enrico]
Bennie Enrico, President

[Signature of Thomas Barbone]
Thomas Barbone, Vice-President

[Signature of Meria Livingston]
Meria Livingston, Secretary

Motion: TOMMY YAZZIE
Second: MARY LEE BEGAY

THE NAVAJO NATION

PPC-04-94-137

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APR 18 1995

WATER RESOURCES
MANAGER
TOMMY CHAVEZ
COUNCILMAN

HARRY JACKSON
COMMUNITY COORDINATOR

PAULINE R. JOE
CLERK-TYPIST I

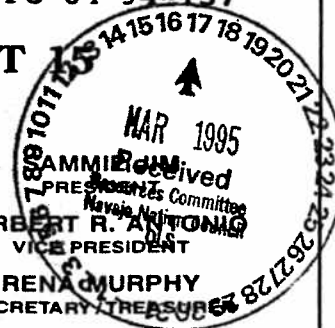
RESOLUTION OF PUEBLO PINTADO CHAPTER THE NAVAJO TRIBE

NAVAJO NATION
DIVISION OF RESOURCES

APR 17 1995

JWRM

HERBERT R. ANTONAG
VICE PRESIDENT
RENA MURPHY
SECRETARY/TREASURER



Support and Re-affirming Resoultion for Navajo-Gallup Water Supply Project

WHEREAS:

1. The Pueblo Pintado Chapter is a certified Navajo Nation Chapter and as such is empowered by the Navajo Nation Council to make favorable decisions on behalf of the Community; and
2. Pueblo Pintado Chapter has advocated for streamlining water supplies to the Navajo Nation and Gallup vicinity from the San River for resident living in the proposed Water Project ; and
3. The Pueblo Pintado Chapter recongnizes the extreme hardship the resident are encountering because of the shortage of water supplies in the designated locations; and
4. The Projected streamlining the water supplies will certainly benefit the Navajo Communities and the inhabitant of Gallup area;and

NOW, THEREFORE BE IT RESOLVED THAT:

1. The Pueblo Pintado Chapter is supporting by re-affirming the previous resolution submitted from this Chapter Advocating for Navajo-Gallup Water Supply Project to become a reality.

C E R T I F I C A T I O N

WE HEREBY CERTIFY THAT THE FOREGOING RESOLUTION was duly considered by Pueblo Pintado Chapter at a duly called meeting at Pueblo Pintado, New Mexico (Navajo Nation) at which a quorum was present and that same passed by a vote of 34 in favor 0 opposed this 17th day of April 1994.

Motion By: Rose Ann Lewis

Second By: Racheal Billie

[Signature]
Council Delegate

[Signature]
Chapter President

RECEIVED

MAY 0 4 1994

Resolution of
Whitehorse Lake Chapter
The Navajo Tribe

Supporting and reaffirming continued planning for the Navajo and Gallup Water Supply Project (Whitehorse Lake/ Rincon Marquis).

WHEREAS:

1. The Whitehorse Lake Chapter is a certified chapter of the Navajo Nation Government and is vested with the authority and responsibility to plan and implement community needs and concerns which will benefit the community; and

2. The Whitehorse Lake Chapter is aware of waterline being implemented from San Juan River and to have existing lines to community areas; and

3. The Whitehorse lake Chapter do have extreme need for water supply and favors the planning to be continue with existing lines to Whitehorse Lake and Rincon Marquis;

NOW THEREFORE BE IT RESOLVED THAT:

1. The Whitehorse Lake Chapter hereby supports and reaffirming continued planning for the Navajo and Gallup Water Supply Project (Whitehorse Lake/ Rincon Marquis):

2. The Whitehorse Lake Chapter appreciate this be given a priority consideration and to approve.

C E R T I F I C A T I O N

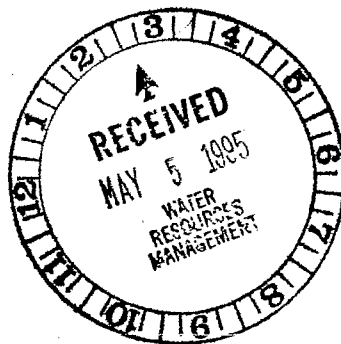
WE HERERY CERTIFY THAT THE FOREGOING RESOLUTION was duly considered by the Whitehorse Lake Chapter (New Mexico), Navajo Nation at which a quorum was present and that same passed by a vote of 39 in favor, and 0 opposed this 20th day of March, 1995.

Sueve Tully
President:

Jimmy J. Chapman
Vice President:

Janie B. Jim
Secretary/Treasurer;

Jimmy Chavez
Council delegate:



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APR 03 1995

COMMUNITY SERVICE PROG.
EASTERN NAVAJO AGENCY

WATER - 5600

Tsa - Ya - Toh Chapter



P.O. Box 86 Mentmore, New Mexico 87249 (505) 722-2649

RESOLUTION OF THE
TSAYATOH CHAPTER OF THE NAVAJO NATION

Reso.No. TSAY 94-0207

Supporting Continued Planning for
the Navajo/Gallup Water Supply Project

WHEREAS:

1. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the Eastern Navajo Nation, the City of Gallup, and communities in the Window Rock area; and,
2. The Tsayatoh Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and,
3. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Tsayatoh Chapter of the Navajo Nation requests that the Navajo public be fully involved in the planning of this important project; and,
2. The Tsayatoh Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

CERTIFICATION

We certify that the foregoing resolution was approved by a vote of 44 in favor, 0 opposed, and 0 abstaining, this 13th day of February, 1994, at a duly called meeting of the Tsayatoh Chapter at which a quorum was present.

James W. Felson, President

Tsayatoh Chapter

Henry B. Hudson, Council Delegate
Navajo Nation Council

Tsayatoh / Manuelito Chapter

RESOLUTION OF THE
STANDING ROCK CHAPTER OF THE NAVAJO NATION

Supporting Continued Planning for
the Navajo/Gallup Water Supply Project

WHEREAS:

1. The U.S. Bureau of Reclamation is conducting studies for the Navajo Nation and the City of Gallup on the feasibility of a pipeline from the San Juan River to serve the current and future water needs of the eastern Navajo Nation, the City of Gallup, and communities in the Window Rock area; and,

2. The Standing Rock Chapter is one of the communities to be served by the Navajo/Gallup Water Supply Project; and,

3. The Navajo Nation is designated to become the lead sponsor of the Navajo/Gallup Water Supply Project.

NOW BE IT THEREFORE RESOLVED THAT:

1. The Standing Rock Chapter of the Navajo Nation requests that the Navajo public be fully involved in the planning of this important project; and,


2. The Standing Rock Chapter of the Navajo Nation supports the actions necessary to plan the Navajo/Gallup Water Supply Project.

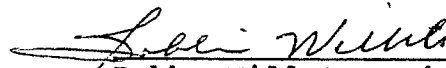
CERTIFICATION

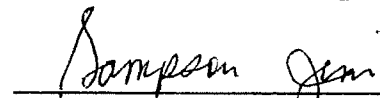
We certify that the foregoing resolution was approved by a vote of 47 in favor, 0 opposed, and 0 abstaining, this 20 day of February, 1994, at a duly called meeting of the Standing Rock Chapter at which a quorum was present.


Lloyd Morgan, President

Standing Rock Chapter


Herbert Joe Pioche, Council
Delegate
Standing Rock Chapter


Bobby Willetto, Vice
President
Standing Rock Chapter


Sampson Jim, Secretary/
Treasurer
Standing Rock Chapter

Motion: Billy Johnson
Second: Juan Casuse



ATTACHMENT E

Resolutions of the Upper Colorado
River Commission

RESOLUTION OF THE
UPPER COLORADO RIVER COMMISSION

Regarding the Use and Accounting of Upper Basin Water Supplied to the Lower Basin in
New Mexico by the Proposed Navajo-Gallup Water Supply Project

WHEREAS, part of the State of New Mexico is within the Upper Basin and part is within the Lower Basin as defined in Article II of the Colorado River Compact (45 Stat. 1057); and

WHEREAS, New Mexico has proposed the Navajo-Gallup Water Supply Project to divert water from the Upper Basin to serve communities located within the Lower Basin in New Mexico; and

WHEREAS, New Mexico needs to provide a water supply for municipal, industrial, commercial and domestic purposes to Navajo and non-Indian communities located within the Lower Basin in New Mexico that do not have an adequate Lower Basin source of water; and

WHEREAS, Subsection 303(d) of Public Law 90-537, the Colorado River Basin Project Act, authorized a thermal generating plant to be located within the State of Arizona and provided that if the plant was served by water diverted from the drainage area of the Colorado River system above Lee Ferry such consumptive use of water would be a part of the consumptive use apportioned to the State of Arizona by Article III (a) of the Upper Colorado River Basin Compact (63 Stat. 31) regardless of whether the plant was located in the Upper Basin or the Lower Basin; and

WHEREAS, the states of Colorado, New Mexico, Utah and Wyoming all support the proposed Navajo-Gallup Water Supply Project, but the states are not in agreement as to whether, under the Law of the River, New Mexico may use a part of its Upper Basin apportionment to serve uses in the Lower Basin portion of New Mexico, without obtaining the consent of the other states. However, in the spirit of comity, and without prejudice to the position of any state regarding these unresolved issues, all the states support and to the extent necessary consent to the Navajo-Gallup Water Supply Project in New Mexico.

NOW, THEREFORE, BE IT RESOLVED by the Upper Colorado River Commission that the States of Colorado, New Mexico, Utah and Wyoming, support and to the extent necessary consent to the diversion of water from the Upper Basin for use in the Lower Basin solely within New Mexico via the proposed Navajo-Gallup Water Supply Project; provided, that any water so diverted by said project to the Lower Basin portion of New Mexico, being a depletion of water at Lee Ferry, shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III (a) of the Upper Colorado River Basin Compact; and

BE IT FURTHER RESOLVED, that the use of any return flows which result from use of water through the Navajo-Gallup Water Supply Project within the Lower Basin shall be subject to applicable laws; and

BE IT FURTHER RESOLVED, that nothing resulting from the implementation of this Resolution shall limit the right or ability of any Upper Basin State to develop the full apportionment made to it under the Colorado River Compact and the Upper Colorado River Basin Compact; and,

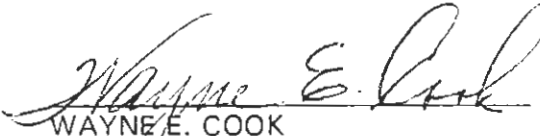
BE IT FURTHER RESOLVED, that the construction and operation of, and use of water through, the Navajo-Gallup Water Supply Project shall be subject to all other applicable provisions of law; and,

BE IT FURTHER RESOLVED, that the Upper Colorado River Commission supports such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project.

CERTIFICATE

I, WAYNE E. COOK, Executive Director and Secretary of the Upper Colorado River Commission, do hereby certify that the above Resolution was adopted by the Upper Colorado River Commission at its Meeting held at the Half Moon Lake Resort near Pinedale, Wyoming on June 17, 2003.

WITNESS my hand this 19th day of June, 2003.


WAYNE E. COOK
Executive Director and Secretary

RESOLUTION OF THE
UPPER COLORADO RIVER COMMISSION

Regarding the Availability of Water from Navajo Reservoir for Navajo Nation Uses
within the State of New Mexico

WHEREAS, the State of New Mexico has proposed the Navajo-Gallup Water Supply Project to provide a needed renewable water supply from the San Juan River for municipal and domestic uses for Indian and non-Indian communities located within New Mexico in both the Upper Basin and the Lower Basin; and

WHEREAS, the State of New Mexico and the Navajo Nation on April 19, 2005, executed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (the "Settlement Agreement"), which is conditioned upon, among other things, the implementation of the Navajo Nation components of the Navajo-Gallup Water Supply Project within New Mexico; and

WHEREAS, the source of water supply for the proposed Navajo-Gallup Water Supply Project would be Navajo Reservoir and the San Juan River in New Mexico; and

WHEREAS, water from Navajo Reservoir and the San Juan River would be delivered to the proposed Navajo-Gallup Water Supply Project to meet the water demands of Navajo Nation communities in New Mexico through a proposed Settlement Contract between the United States, acting through the Secretary of the Interior, and the Navajo Nation (Appendix 4 to the Settlement Agreement); and

WHEREAS, Public Law 87-483 at section 11(a) requires that no new long-term contracts "... shall be entered into for the delivery of water stored in Navajo Reservoir or any other waters of the San Juan River and its tributaries, as aforesaid, until the Secretary has determined by hydrologic investigations that sufficient water to fulfill said contract is reasonably likely to be available for use in the State of New Mexico during the term thereof under the allocations made in articles III and XIV of the Upper Colorado River Basin compact, and has submitted such determination to the Congress of the United States and the Congress has approved such contracts"; and

WHEREAS, pursuant to Public Law 87-483, and in furtherance of the Jicarilla Apache Tribe Water Rights Settlement Act of 1992 and the Navajo Reservoir water supply contract approved by said Act, the Secretary of the Interior on February 2, 1989, approved the report on "Hydrologic Determination, 1988, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico" (the "1988 Hydrologic Determination"); and

WHEREAS, the 1988 Hydrologic Determination evaluated the availability of water from the Navajo Reservoir supply for uses in New Mexico through the 2040 planning horizon; and

WHEREAS, an update and extension to the 1988 Hydrologic Determination is needed to evaluate the availability of water from the Navajo Reservoir supply through a 2060 planning horizon under the allocation of water made to the State of New Mexico by the Upper Colorado River Basin Compact for the purpose of furthering Congressional legislative approval of the Settlement Agreement, the authorization of the proposed Navajo-Gallup Water Supply Project, and the legislative approval of the proposed Settlement Contract for the Navajo Nation's project uses in New Mexico; and

WHEREAS, the proposed Settlement Contract between the United States and the Navajo Nation would provide water supplies for Navajo Nation uses in New Mexico under both the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project which was authorized by Public Law 87-483, and would supersede the existing Navajo Reservoir water supply contract for the Navajo Indian Irrigation Project; and

WHEREAS, the US Bureau of Reclamation has presented to the Upper Colorado River Commission for its consideration a draft hydrologic determination, dated May 2006, that evaluates the availability of water from the Navajo Reservoir supply through 2060 and shows: (1) at least 5.76 million acre-feet of water is reasonably available annually for use by the Upper Basin, exclusive of reservoir evaporation at Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs of the Colorado River Storage Project; and (2) sufficient water is reasonably likely to be available from the Navajo Reservoir supply to fulfill the proposed Settlement Contract for the Navajo Nation's uses in New Mexico under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project, in addition to existing Navajo Reservoir water supply contracts for other uses, under the allocations made to New Mexico in Articles III and XIV of the Upper Colorado River Basin Compact; and

WHEREAS, the Settlement Agreement would provide at subparagraph 9.3.1: "The Navajo Nation and the United States agree that the State of New Mexico may administer in priority water rights in the San Juan River Basin in New Mexico, including rights of the Navajo Nation, as may be necessary for New Mexico to comply with its obligations under interstate compacts and other applicable law"; and

WHEREAS, the Upper Colorado River Commission supports water resource development in the Upper Colorado River Basin to enable the Upper Division States to fully develop their compact apportionments of Colorado River water while meeting compact obligations relating to the flow of the Colorado River at Lee Ferry; and

WHEREAS, it is the position of the Upper Colorado River Commission and the Upper Division States that, with the delivery at Lee Ferry of 75 million acre-feet of water in each period of ten consecutive years, the water supply available in the Colorado River

System below Lee Ferry is sufficient to meet the apportionments to the Lower Basin provided for in Articles III (a) and III (b) of the Colorado River Compact; and

WHEREAS, it is the position of the Upper Colorado River Commission and the Upper Division States that the obligation of the Upper Basin under Article III(c) of the Colorado River Compact to deliver water toward the Mexican Treaty obligation does not require the delivery at Lee Ferry of 0.75 million acre-feet of water annually; and

WHEREAS, the Upper Colorado River Commission anticipates that the Upper Division States will take all actions necessary to ensure that all Upper Basin States have access to their respective apportionments as specified in the Upper Colorado River Basin Compact; and

WHEREAS, the Upper Colorado River Commission on June 19, 2003, resolved that: (1) “the States of Colorado, New Mexico, Utah and Wyoming, support and to the extent necessary consent to the diversion of water from the Upper Basin for use in the Lower Basin solely within New Mexico via the proposed Navajo-Gallup Water Supply Project; provided, that any water so diverted by said project to the Lower Basin portion of New Mexico, being a depletion of water at Lee Ferry, shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III (a) of the Upper Colorado River Compact;” and (2) “the Upper Colorado River Commission supports such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project.”

NOW, THEREFORE, BE IT RESOLVED by the Upper Colorado River Commission, that the Commission supports Congressional action to: (1) approve the Settlement Agreement; (2) authorize the proposed Navajo-Gallup Water Supply Project; and (3) approve the proposed Settlement Contract for the Navajo Nation’s uses in New Mexico from the Navajo Reservoir supply under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project.

BE IT FURTHER RESOLVED, that while the Upper Colorado River Commission does not endorse all of the study assumptions used by the Bureau of Reclamation in its May 2006 draft hydrologic determination, including an assumption of a 6 percent allowable overall shortage, and specifically disagrees with the modeling assumption of a minimum Upper Basin delivery of 8.25 million acre-feet annually at Lee Ferry, the Commission supports a determination by the Secretary of the Interior that at least 5.76 million acre-feet of water is available annually for use by the Upper Basin, exclusive of reservoir evaporation at Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs of the Colorado River Storage Project.

BE IT FURTHER RESOLVED, that the Upper Colorado River Commission supports a determination by the Secretary of the Interior that sufficient water is reasonably likely to be available to fulfill the proposed Settlement Contract for the Navajo Nation’s uses in New Mexico from the Navajo Reservoir supply under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project, in addition

to existing Navajo Reservoir water supply contracts for other uses, under the allocations made to New Mexico in Articles III and XIV of the Upper Colorado River Basin Compact.

BE IT FURTHER RESOLVED, that nothing in this Resolution, or resulting from the adoption of this Resolution, shall limit the right or ability of any Upper Basin State to develop the full apportionment made to it under the Colorado River Compact and the Upper Colorado River Basin Compact.

BE IT FURTHER RESOLVED, that a copy of this resolution be transmitted to the Regional Director, Upper Colorado Region, Bureau of Reclamation, Salt Lake City, Utah.

CERTIFICATE

I, Don A. Ostler, Executive Director and Secretary of the Upper Colorado River Commission, do hereby certify that the Upper Colorado River Commission adopted the above Resolution at its regular meeting held in Jackson Hole, Wyoming, on June 5, 2006.

WITNESS my hand this 9th day of June 2006.



DON A. OSTLER
Executive Director and Secretary



ATTACHMENT F

Letter from Jicarilla Apache Tribe to
the Bureau of Reclamation



THE JICARILLA APACHE TRIBE

ORIGINAL COPY

FEB 23 '01

CLASS: WTR-44.03

FOLDER: 60

PROJECT: 71665

CONTROL #: 10003100

NAME	DATE	INITIAL	CYS
E. Green	2/11	EG	
W. Green	2/11	WG	
R. Green	2/11	R	
Green			
Green			

February 16, 2001

Ms. Carol DeAngelis, Area Manager
 Western Colorado Area Office
 US Bureau of Reclamation
 2764 Compass Drive, Suite 106
 Grand Junction CO 81506-8785

RE: Your Letter Dated January 22, 2001 - Water Service Contracts from Navajo Reservoir and the Subject Meeting Held on January 29, 2001.

Dear Ms. DeAngelis:

Thank you for your letter informing the Jicarilla Apache Nation (formerly the Jicarilla Apache Tribe) of the intentions of the Navajo Nation and the City of Gallup regarding their respective requests for contracts for water from the Navajo Reservoir supply for the proposed Navajo-Gallup Water Supply Project (the Project).

As you are aware, the Nation is a cooperating agency in the San Juan River Recovery Implementation Program and has recently signed a cooperating agency agreement for the Navajo Dam Operations Environmental Impact Statement (EIS). In addition, the Nation has provided comments regarding the Supplemental EIS for the Animas-La Plata Project. In each of these processes, the Nation has expressed its desire to support the goals of these federal actions while expressing its concerns about their impacts on the Nation's ability to fully utilize its water rights under the Jicarilla Apache Tribe Water Rights Settlement Act, Pub. L. No. 102-441, 106 Stat. 2237 (1992), as modified by Pub. L. No. 104-261, 110 Stat. 3176 (1996) and Pub. L. No. 105-256, 112 Stat. 1896 (1998) (the Settlement Act).

The Nation has recently exercised its authority to subcontract to third parties in the San Juan basin by negotiating a water lease agreement with Public Service Company of New Mexico for the San Juan Generating Station formerly under contract with the Secretary of Interior. The Nation has also negotiated two additional lease agreements with "minor contractors" in the basin. These actions preserve the opportunity to develop a long term water supply for on-reservation use as determined by the Legislative Council of the Nation. They also demonstrate the

Nation's willingness to work with the agencies, water users and our neighboring tribes with interests in the San Juan basin to accomplish mutually beneficial goals under the water development constraints in the basin.

With regard to this Project, the Nation supports the goal of obtaining a high quality, reliable water supply for the Navajo communities that lack water service. We empathize with the Navajo people because the Jicarilla Apache people have similar unmet basic needs.

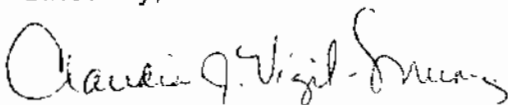
Accordingly, the Nation is interested in investigating the potential of subcontracting a portion of its San Juan River basin Settlement Act water rights for use in the area served by the Project. The Nation is also interested in the potential for the Project to serve a water supply need in the southwest portion of the Jicarilla Apache Reservation. We are investigating the feasibility of participating in the Project.

The Nation understands that certain threshold questions must be expeditiously addressed to assure that all parties satisfactorily benefit without delaying the schedule of the Project for Congressional actions. One of those questions is how will our plans to divert and beneficially use our Settlement Act water rights be affected if we are not participants in the Project, and conversely, how will participation in the Project support our water use plans and long-term development goals? In light of the Bureau of Reclamation's trust duty to the Nation, we request your assistance in addressing these questions.

By copy of this letter, the Nation advises the Navajo Nation and the City of Gallup of its position. The Nation intends to engage in substantive discussions with the Navajo Nation, the City of Gallup and Reclamation regarding an appropriate water supply for the project and options for serving a portion of the Jicarilla Apache Reservation through the Project infrastructure.

The point of contact for this issue is Mike Hamman, who is the Water Administrator for the Nation. He can be reached at (505) 753-0163 or by email at mikehamman@msn.com. Your interest and consideration of these matters is appreciated.

Sincerely,

A handwritten signature in cursive script that reads "Claudia Vigil-Muniz".

Claudia Vigil-Muniz, President

Cc: Honorable Kelsey A. Begaye, President
The Navajo Nation
P.O. Box 9000
Window Rock, AZ 86515

Honorable John Peña, Mayor
City of Gallup
P.O. Box 1270
Gallup, NM 87301

John Leeper, Director
Navajo Nation Water Management Branch
P.O. Box 678
Ft. Defiance, AZ 86505

Dan Isreal, Attorney
City of Gallup
HC5 Box 69A
211 White Way
Pason, AZ 85541

Joy Nicholopoulos, Field Supervisor
Fish and Wildlife Service
2105 Osuna NE
Albuquerque, NM 87113

Thomas C. Turney, State Engineer
P.O. Box 25102
Santa Fe, NM 87504-5102

Phil Mutz
NM Interstate Stream Commission
P.O. Box 25102
Santa Fe, NM 87504-5102

Lester K. Taylor, Nordhaus, Haltom, Taylor, Taradash & Bladh, LLP
Susan G. Jordan, Nordhaus, Haltom, Taylor, Taradash & Bladh, LLP
Joe Muniz, Natural Resources
Kurt Sandoval, Water Commission
Mike Hamman, Water Administrator



ATTACHMENT G

Letter from Honorables Kelsey A. Begaye
and John Peña to Commissioner of the
Bureau of Reclamation



THE NAVAJO NATION

P O Box 9000
Window Rock, Arizona 86515
(520) 871-6000

THE CITY OF GALLUP

P O Box 1270
Gallup, New Mexico 87301
(505) 863-1220



HON. KELSEY A. BEGAYE
PRESIDENT

HON. JOHN PEÑA
MAYOR

November 22, 2000

Eluid Martinez, Commissioner
Bureau of Reclamation
U.S. Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240

Re: Request for Contracts from Navajo Reservoir Water Supply

Dear Commissioner Martinez:

As you are aware, the Navajo Nation and the City of Gallup are collaborating on a joint effort to evaluate the feasibility of, and hopefully construct, a waterline from the San Juan River that would deliver municipal water to Navajo communities in northwest New Mexico and northeast Arizona and to the City of Gallup, New Mexico ("Navajo-Gallup Water Supply Project" or "the Project"). One of the critical elements of the on-going analysis concerns the identification of a water supply for the Project. By this letter we are requesting the Bureau of Reclamation to begin the contract process that would provide a water supply for the Project from Navajo Reservoir in the amount of 36,600 acre-feet for fifty (50) years. Specifically, we are requesting two fifty (50) year contracts, one for the Navajo Nation in the amount of 29,300 acre-feet per year and one for the City of Gallup in the amount of 7,500 acre-feet per year.

The Navajo Nation is currently in negotiations with the State of New Mexico concerning its ultimate water right entitlement in the San Juan River Basin. It is too early to speculate as to the quantities of water that a Navajo settlement might contain; however, both parties have expressed support for a settlement that includes a water supply for the Navajo-Gallup Water Supply Project. Based on the 1988 Hydrologic Determination, as refined by the Year 2000 depletion calculations, the State of New Mexico believes there is sufficient unused water in the apportionments to the Upper Colorado River Basin states that could provide a supply for the Project for at least the next fifty (50) years. The 1988 Hydrologic Determination provides an analysis of water availability through the year 2039. We believe it would be prudent, and acceptable to the Upper Basin states, to extend the 1988 Hydrologic Determination for an additional twenty (20) years. The unused apportionment in the Upper Basin should be sufficient to provide the water necessary for the Project for at least fifty (50) years.

Representatives of the Navajo Nation and the City of Gallup have had preliminary discussions with Reclamation staff concerning the proposed contracts. We believe that contracts can be authorized with various conditions that protect the existing contracts for water supplies from Navajo Reservoir and the endangered species in the San Juan River. For example, the water supply for these contracts could be conditioned upon the unused apportionments being available in the Upper Basin. Should water development occur at a faster pace than predicted in the 1988 Hydrologic Determination, the Navajo Nation and the City of Gallup would have to look elsewhere for a water supply. One possible source might be to lease water from the Jicarilla Apache Tribe.

Similarly, with respect to the protection of endangered fish species, the contract should condition the delivery of water on compliance with the Endangered Species Act and other environmental requirements. We are hopeful that the current efforts to refine the hydrologic modeling will yield additional depletions from the San Juan River for the Project. If additional depletions are not forthcoming, the Project may be forced to work with other water users to develop a depletion schedule that is consistent with the flow recommendations adopted by the San Juan River Recovery Implementation Program. Other water users may be willing to forbear their depletions during the times the water is needed for endangered species. We believe there is sufficient flexibility in the San Juan River system to protect the endangered species while moving forward with much needed water development such as the Navajo-Gallup Water Supply Project.

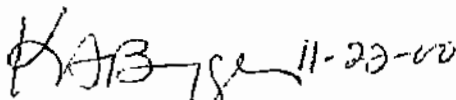
Mr. Commissioner, we have a limited window of opportunity to accomplish these objectives. The identification of the water supply for the project is the single most time-critical element in the preparation of the draft Environmental Impact Statement for the Project. By copy of this letter to the Western Colorado Area Office, we are evincing our intent to work collaboratively with your staff to achieve the objectives set forth in this letter. We also recognize that it will be necessary to work with the Fish and Wildlife Service to ensure that depletions made pursuant to these contracts are consistent with the flow regimes necessary to protect the endangered fish species.

We understand that you may be in Las Vegas in December for the Colorado River Water Users Association annual meeting. We know that significant demands will be placed on your time; however, we would greatly appreciate the opportunity to have our representatives provide you with a briefing at that time. Please let us know when we could meet with you at your earliest possible convenience to discuss this matter.

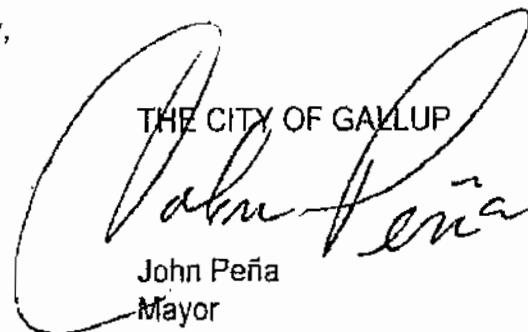
Thank you for your anticipated cooperation.

Sincerely,

THE NAVAJO NATION


Kelsey A. Begaye
President

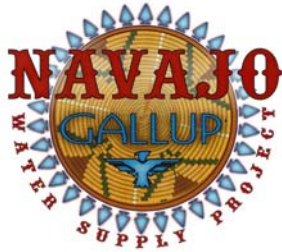
THE CITY OF GALLUP


John Peña
Mayor

xc: Carol DeAngelis
Western Colorado Area Office, Bureau of Reclamation

Philip Mutz
New Mexico Interstate Stream Commission

Joy Nicholopoulos
Ecological Services, Albuquerque Field Office, U.S. Fish and Wildlife Service



ATTACHMENT H

Letters from the Commissioner of the Bureau of Reclamation and the Upper Colorado Regional Director to Honorables Kelsey A. Begaye and John Peña

FAX TRANSMITTAL

of pages ▶ 6

To <i>Reye</i>	From <i>aw</i>
Dept./Agency <i>Reye</i>	PHONE # Fax #
FAX #	

of the Interior



ON

DEC 26 2000

W-6334

Kelsey A. Begaye
President
Navajo Nation
P.O. Box 9000
Window Rock, Arizona 86515

Dear President Begaye:

Thank you for your letter of November 23, 2000 requesting contracts for water out of Navajo Reservoir for the Navajo-Gallup Water Supply Project (Project).

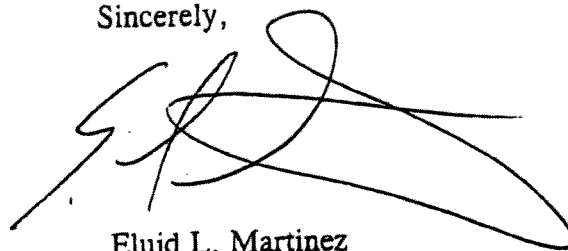
The Bureau of Reclamation realizes the importance of water now, and in the future, to your communities and fully supports this Project. I applaud your collaborative efforts to plan for your future water supplies.

With regard to the specific issues in your letter, I must address the 50-year contract term that you requested. Reclamation law restricts our contract term to 40 years which is further restricted by Reclamation policy to 25 years. Reclamation policy allows waivers for contracts up to a 40-year term if certain conditions are met. Reclamation has successfully negotiated 40-year contracts based on this policy. With regard to contract term, and the other issues in your letter (Hydrologic Determination and endangered species), my staff looks forward to working with you to resolve all of these issues. As I am sure you are aware, these contracts would require Congressional approval as described in the June 13, 1962 Act authorizing water service contracts from Navajo Reservoir.

I appreciate the innovative options you proposed. The complexities of water development in the San Juan Basin will require all of us to be creative with our solutions. We would expect to work with Regional and State officials as we address hydrologic and other issues. Also, we will all need to work closely with the Fish and Wildlife Service on the endangered species issues.

I have enjoyed working with you in my capacity as the Commissioner of Reclamation, and wish you well on the future of this project. I can assure you that the staff of the Upper Colorado Region and the Western Colorado Area Office will continue to serve you through this transition and the next administration.

Sincerely,

A handwritten signature in black ink, appearing to read 'Eluid L. Martinez', with a large, sweeping flourish at the end.

Eluid L. Martinez
Commissioner

cc: Honorable Pete V. Domenici
SH-328, 2nd & C Streets, NE
Washington, DC 20510

Honorable Jeff Bingaman
SH-703, 2nd & C Streets, NE
Washington, DC 20510

Honorable Heather A. Wilson
226 CHOB, 1st Street & Independence Avenue, SE
Washington, DC 20515

Honorable Joe Skeen
2302 RHOB, Independence Avenue & S. Capitol Street, SW
Washington, DC 20515

Honorable Tom Udall
502 CHOB, 1st Street & Independence Avenue, SE
Washington, DC 20515

Thomas Turney, State Engineer
State of New Mexico
PO Box 25102
Santa Fe, New Mexico 87504-5102

Philip Mutz
Interstate Stream Commission
P.O. Box 25102
Santa Fe, New Mexico 87504-5102

John Whipple
Interstate Stream Commission
P.O. Box 25102
Santa Fe, New Mexico 87504-5102

Joy Nicholopoulos
US Fish & Wildlife Service
2105 Osuna NE
Albuquerque, New Mexico 87113

Carol DeAngelis
Area Manager
Grand Junction, Colorado 81506

Rick Gold
Acting Regional Director
Salt Lake City, Utah 84138-1102



IN REPLY REFER TO:

United States Department of the Interior



BUREAU OF RECLAMATION

Washington, D.C. 20240

DEC 6 2000

W-6334

John Pena
Mayor
City of Gallup
P.O. Box 1270
Gallup, New Mexico 87301

Dear Mayor Pena:

Thank you for your letter of November 23, 2000 requesting contracts for water out of Navajo Reservoir for the Navajo-Gallup Water Supply Project (Project).

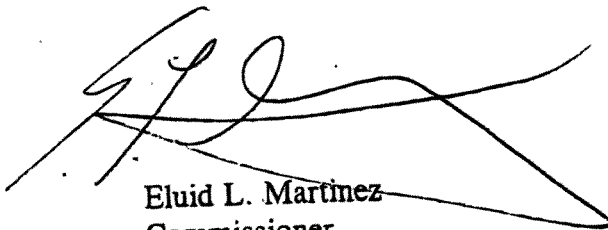
The Bureau of Reclamation realizes the importance of water now, and in the future, to your communities and fully supports this Project. I applaud your collaborative efforts to plan for your future water supplies.

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I have enjoyed working with you in my capacity as the Commissioner of Reclamation, and wish you well on the future of this project. I can assure you that the staff of the Upper Colorado Region and the Western Colorado Area Office will continue to serve you through this transition and the next administration.

Sincerely,



Eluid L. Martinez
Commissioner

cc: Honorable Pete V. Domenici
SH-328, 2nd & C Streets, NE
Washington, DC 20510

Honorable Jeff Bingaman
SH-703, 2nd & C Streets, NE
Washington, DC 20510

Honorable Heather A. Wilson
226 CHOB, 1st Street & Independence Avenue, SE
Washington, DC 20515

Honorable Joe Skeen
2302 RHOB, Independence Avenue & S. Capitol Street, SW
Washington, DC 20515

Honorable Tom Udall
502 CHOB, 1st Street & Independence Avenue, SE
Washington, DC 20515

Thomas Turney, State Engineer
State of New Mexico
PO Box 25102
Santa Fe, New Mexico 87504-5102

Philip Mutz
Interstate Stream Commission
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Joy Nicholopoulos
US Fish & Wildlife Service
2105 Osuna NE
Albuquerque, New Mexico 87113

Carol DeAngelis
Area Manager
Grand Junction, Colorado 81506

Rick Gold
Acting Regional Director
Salt Lake City, Utah 84138-1102



United States Department of the Interior

BUREAU OF RECLAMATION

Upper Colorado Regional Office
125 South State Street, Room 6107
Salt Lake City, Utah 84138-1102

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CLASS	WTR 4.03		
FOLDER	71605		
PROJECT	50		
CONTROL #	1001155		
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Edwards			
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Davis			
DeBorja			
Pleach			
M Francis			

IN REPLY REFER TO:

UC-443
WTR-4.00

JUN 13 2001

Kelsey A. Begaye, President
The Navajo Nation
P.O. Box 9000
Window Rock, AZ 86515

John Pena, Mayor
The City of Gallup
P.O. Box 1270
Gallup, NM 87301

Subject: Requests for Contracts from Navajo Reservoir Water Supply

Dear President Begaye and Mayor Pena:

Thank you for your letter of November 22, 2000, to the Commissioner of Reclamation, requesting the subject contracts for the Navajo-Gallup Water Supply Project (Project). The Commissioner responded by letter of December 26, 2000, offering full support of the Project and Reclamation's assistance in the resolution of contract issues.

Prior to pursuing the water supply contracts, which are crucial for project authorization and development, we have identified the following unresolved issues which must be addressed:

1. Hydrologic Determination of water availability
2. Endangered Species Act compliance
3. National Environmental Policy Act (NEPA) compliance for the contracts and Project
4. Colorado River Basin Issues in New Mexico and Arizona
5. Congressional Authorization of the Project
6. Congressional Approval of Long-term Contracts from Navajo Reservoir

To address these issues, Reclamation desires to enter into a Memorandum of Understanding (MOU) with the Nation and City to describe and establish the responsibilities and required commitments for each organization (Reclamation, Nation and City). It may be desirable to include the Jicarilla Apache Nation (Jicarillas) in the MOU, as your Nation's and City's May 16, 2001, response to the Jicarillas, indicates the potential to use their water supplies.

To expedite development of the MOU, with a target completion this fall, each involved organization needs to designate a representative, capable of establishing acceptable organizational responsibilities and commitments. Please relay, by July 1, 2001, the name, telephone number and any other pertinent information of your designated representative to either of the Reclamation contacts given below.

ADMIN RECORD

Reclamation understands the urgency and importance of this Project and is committed and willing to assist in its realization. Please contact Carol DeAngelis, Area Manager of the Western Colorado Area Office at (970) 248-0690 or Rege Leach of the Western Colorado Area Office in Durango at (970) 385-6553, concerning this issue.

Sincerely,

Rick L. Gold

Rick L. Gold
Regional Director

Enclosure

cc: (all with enclosures)

Philip Mutz
New Mexico Interstate Stream Commission
PO Box 25102
Santa Fe, New Mexico 87504-5102

Tom Turney, State Engineer
State of New Mexico
PO Box 25102
Santa Fe, New Mexico 87504-5102

Joy Nicholopoulos, Field Supervisor
U.S. Fish and Wildlife Service
2105 Osuna NE
Albuquerque NM 87113

Claudia Vigil-Muniz, President
Jicarilla Apache Nation
P.O. Box 507
Dulce NM 87528

Joe Muniz, Director
Natural Resources Department
Jicarilla Apache Nation
P.O. Box 507
Dulce NM 87528

Mike Hamman, Water Administrator
Jicarilla Apache Nation
26 Catherine Lane
Española NM 87532

Susan G. Jordan, Esq.
Nordhaus, Haltom, Taylor, Taradash & Bladh, LLP
200 W. de Vargas Street, Suite 9
Santa Fe NM 87501

Lester K. Taylor, Esq.
Nordhaus, Haltom, Taylor, Taradash & Bladh, LLP
500 Marquette Ave., N.W., Suite 1050
Albuquerque NM 87102

Stanley M. Pollack, Water Rights Counsel
Navajo Nation Department of Justice
P.O. Box 2010
Window Rock, Navajo Nation (AZ) 86515

John Leeper, Director
Navajo Nation Water Management Branch
PO Box 678
Ft. Defiance AZ 86505

John Cawley (BIA 340)
Bureau of Indian Affairs
PO Box 26567
Albuquerque NM 87125-6567

bc: Area Manager, Grand Junction, Colorado (without enclosures)
Attention: WCG-CDeAngelis

Western Colorado Area Office, Durango, Colorado (without enclosures)
Attention: WCD-RLeach

UC-406 (with enclosures)



ATTACHMENT I

Preferred Alternative



Attachment I

PREFERRED ALTERNATIVE

OVERVIEW

This attachment presents details of the preferred alternative, the San Juan River Public Service of New Mexico (SJRPNM) Alternative. The description of the preferred alternative includes the system's configuration and associated considerations and features, including:

- Water supply and demand
- Physical description
- Water quality and treatment
- Land requirements, damages, and rights-of-way (ROW)
- Cultural resource issues
- Environmental mitigation
- Navajo-Gallup Water Supply Project (proposed project) construction, ownership, and operation, maintenance, and replacement (OM&R) costs
- Economic analysis
- Financial analysis

Figure I-1 is a map of the proposed project area showing project area landmarks and the SJRPNM Alternative facilities. The SJRPNM Alternative would divert water from the San Juan River downstream of Fruitland, New Mexico, just above the existing Public Service Company of New Mexico (PNM) diversion structure, treat the water, and then deliver it along Highway N36 and south to Navajo chapters along U.S. Highway 491 (shown in figure I-2). Water delivery would continue to the Navajo Nation Capital at Window Rock, Arizona, and to the city of Gallup, New Mexico. Another diversion

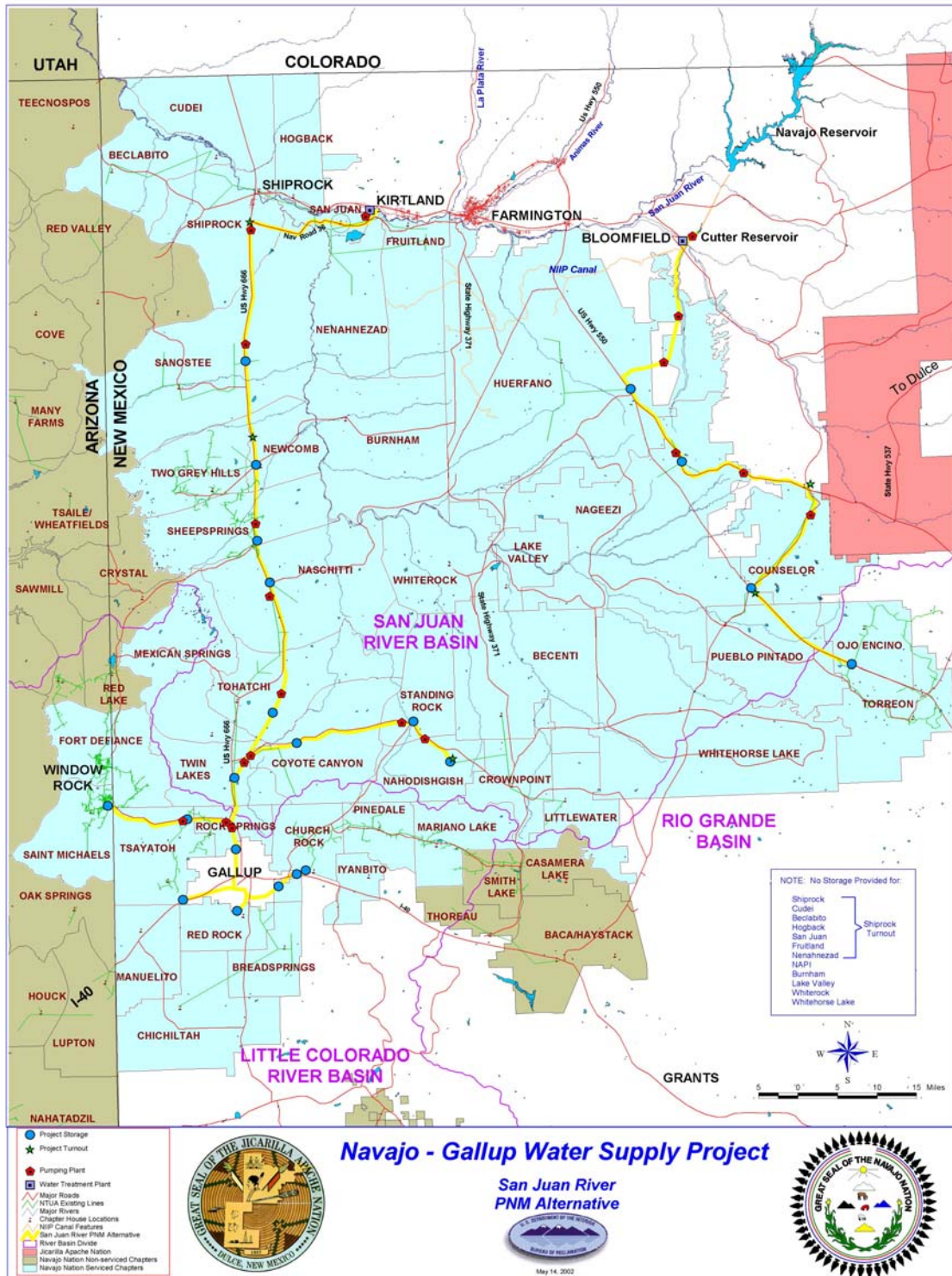


Figure I-1.—SJRPNM Alternative (preferred alternative).

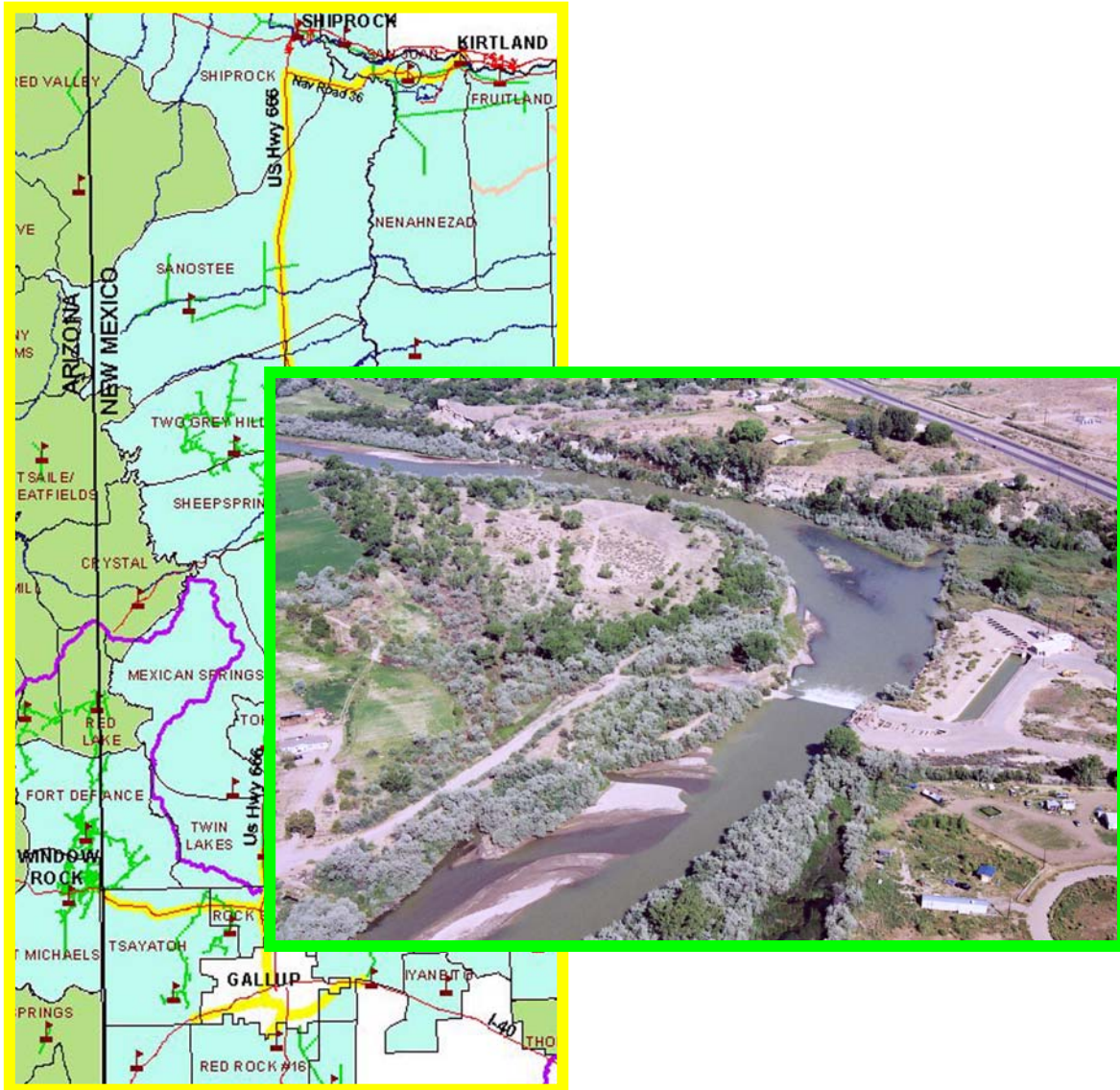


Figure I-2.—PNM diversion dam (project diversion point along the San Juan River).

would occur from Cutter Reservoir (figure I-3), an existing regulating reservoir on the Navajo Indian Irrigation Project (NIIP), conveying water to the eastern portion of the Navajo and the Jicarilla Apache Nations. The water would be provided to Window Rock, Arizona, and Crownpoint, New Mexico, through sublaterals. While basic design components were described in chapter IV, other components specific to the preferred alternative are described in this attachment.

TOTAL PROJECT WATER SUPPLY AND DEMAND

The proposed project is designed to divert a total of 37,764 acre-feet per year (AFY) from the San Juan River with a resulting depletion of 35,893 acre-feet to the San Juan River Basin, based on 2040 projected population with a demand rate of 160 gallons per capita per day (gpcd). The Cutter diversion would require 4,645 AFY with no return flow to the San Juan River. The PNM diversion would take the remaining 33,119 AFY of diversion, with an average return flow of 1,871 AFY. (The planned diversion and depletion by location is shown in table I-1).

It is assumed that the only return flow from the proposed project to the San Juan River would enter the river at the Shiprock waste water treatment plant. There may be some water delivery to users with individual septic systems in the Shiprock area, but the delivery is expected to be a small percentage of the total. All other deliveries would have similar losses, but the resulting return flow would be lost to evaporation or to recharging local groundwater aquifers. For water balance purposes, no return flow to the San Juan River from these other locations is expected or accounted for. Return flow to the Rio Grande or Little Colorado Rivers is highly unlikely, even though there would be discharge to the groundwater in these areas. Local groundwater storage space, together with local pumping, would limit the potential for surface discharge. Even if surface discharge does occur, the distance to the Rio Grande or Little Colorado Rivers is so great that it is unlikely that return flows would reach these rivers.

Deliveries typically vary depending on changes in demand, and the largest demand is in the summer months. The Shiprock water delivery pattern for March 1992 through February 1993, shown in table I-2, was used to determine average monthly deliveries, and return flows were assumed to follow the same distribution. The system would be designed to handle a 7-day peak demand for pumping plants and pipelines and is computed as 1.3 times the peak average monthly demand. Daily and diurnal demand peaking would be handled by the proposed project storage tanks.

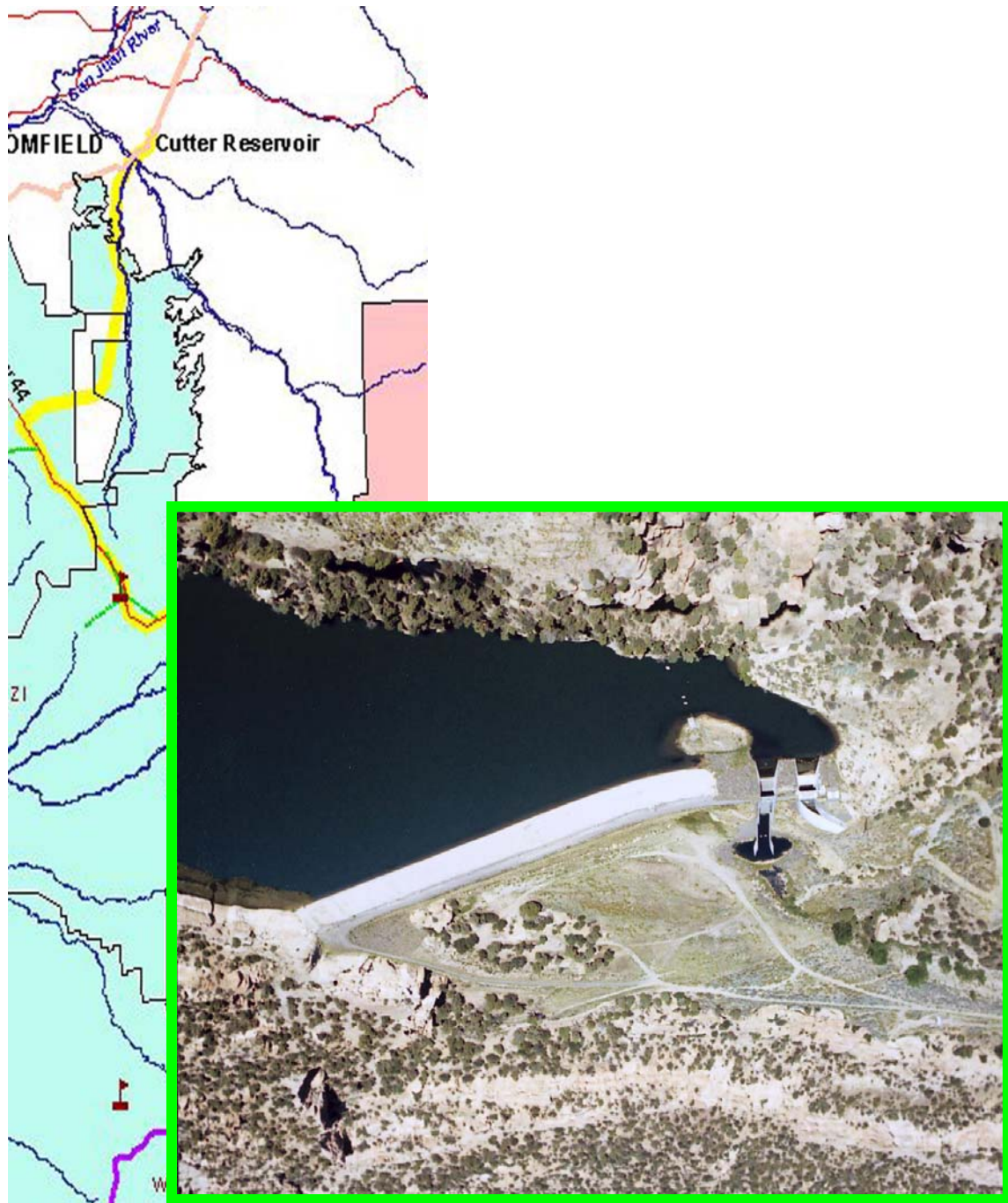


Figure I-3.—Cutter Dam and Reservoir.

Table I-1.—Project forecast 2040 demand and design capacity by service area

Location	San Juan River diversion (AFY)	San Juan River depletion (AFY)
City of Gallup, New Mexico	7,500	7,500
Jicarilla Apache Nation	1,200	1,200
Navajo Nation, New Mexico		
Central area	834	834
Crownpoint	2,473	2,473
Gallup area	4,316	4,316
Huerfano	864	864
Rock Springs	2,118	2,118
Route 491	5,366	5,366
Torreon	2,240	2,240
San Juan River	3,742	1,871
Navajo Agricultural Products Industry industrial uses	700	700
Navajo Nation, Arizona (Window Rock area)	6,411	6,411
Total Navajo Nation	29,064	27,193
Project total	37,764	35,893

Table I-2.—Monthly demand pattern for all deliveries

Month	Percent demand	Month	Percent demand
January	7	July	10
February	6	August	10
March	9	September	10
April	7	October	8
May	9	November	7
June	10	December	7

Navajo Nation

The proposed projected project water need for the Navajo Nation is a total diversion of 29,064 AFY. Of this, 6,411 AFY is for use in the Window Rock area of Arizona and 22,653 AFY is for use in the eastern portion of the reservation in New Mexico. The 22,653 AFY of water would come from Navajo Reservoir (3,445 AFY) through the Cutter diversion and from the San Juan River at the existing PNM diversion dam (19,208 AFY).

Water for the proposed project's New Mexico part of the Navajo Nation (22,653 AFY) would be supplied from New Mexico State Engineer File Nos. 2849 and 3215 held by the Secretary of the Interior (Secretary). This would be administered through a long-term water supply contract between the Bureau of Reclamation (Reclamation) and the Navajo Nation.

Consumptive uses by the Navajo Nation under the proposed project within Arizona and near Window Rock must be supplied from the apportionments or allocations of water made to the State of Arizona by compact or decree. The *Colorado River System Consumptive Uses and Losses Report, 1996–2000* (Reclamation, February 2004), estimates that current consumptive uses within the Upper Basin in Arizona amount to about 38,100 AFY. Thus, there appears to be adequate unused apportionment within the 50,000 AFY of Upper Basin consumptive use apportioned to the State of Arizona by article III(a) of the Upper Colorado River Basin Compact to source the Arizona portion of the proposed project. Use of Arizona's Upper Basin apportionment in the Lower Basin in Arizona for the Navajo Nation's project uses in the Window Rock area would be consistent with the provisions of section 303(d) of the Colorado River Basin Project Act and the June 2003 Resolution of the Upper Colorado River Commission consenting to New Mexico's use of its Upper Basin apportionment in the Lower Basin in New Mexico for project uses in Gallup and surrounding areas. The Arizona Water Settlements Act (S 437 – 108th Congress, January 20, 2004, §104, Allocation of the Central Arizona Project) provides that the Secretary is to retain 6,411 acre-feet of water from the Central Arizona Project for a future water rights settlement agreement. The State of Arizona and the Navajo Nation are in the process of determining which State water would be identified and accounted for to supply project demands. A diversion permit from the State of New Mexico would be required to divert water in New Mexico. Permits and/or contracts for using the Arizona water would be required and would be dependent on which source of water is used to supply the proposed project demand.

Jicarilla Apache Nation

The projected project water need for the Jicarilla Apache Nation is a total diversion of 1,200 AFY. All of this water would come from Navajo Reservoir to be supplied from

New Mexico State Engineer File No. 2849. This is part of the water obtained by the Jicarilla Apache Nation through the Jicarilla Apache Nation Apache Tribe Water Right Settlement Act, Public Law 102-441, October 23, 1992. This water would be made available through the existing Settlement Contract between the Jicarilla Apache Nation and the United States.

City of Gallup, New Mexico

The city of Gallup holds no water rights in the San Juan River and would be obtaining a long-term water supply contract for 7,500 AFY of water. The city has requested a water supply contract from Reclamation. As part of water right settlement and trust responsibilities, Reclamation asked the Jicarilla Apache Nation if it would be interested in providing this need with water it holds from its water rights settlement agreement. The Jicarilla Apache Nation was interested and is in the process of discussing terms and conditions of a long-term water contract with the city of Gallup (see attachment F). A long-term water supply subcontract between the city of Gallup and the Jicarilla Apache and/or the Navajo Nation and approved by the United States would consummate this arrangement.

Physical Description

The river intake would divert 33,118 AFY of water from the San Juan River from the water pool created by the existing PNM diversion dam. Water entering the intake would pass through a self-cleaning screen and then enter a sump where low-head pumps would lift the water into settling ponds for removal of suspended sediment. From the settling ponds, the water would enter a water treatment plant to be treated to meet safe drinking water standards. The treatment plant and pumping plant would occupy approximately 18 acres of land on the north side of the river just upstream from the existing PNM diversion dam.

The treated water would be pumped into the San Juan Lateral, a buried pipeline that crosses the San Juan River and ascends a mesa south of the river. Seven relift pumping stations would be constructed along the San Juan Lateral to keep the water flowing in the pipeline. The pipeline would extend south to Ya-ta-hey, New Mexico, and would connect to spur pipelines extending to Window Rock, Arizona; Gallup, New Mexico; and Crown Point, New Mexico. Navajo communities that have an existing water distribution system would have a storage tank and a method to increase (by means of a pumping plant) the pressure for proper distribution. In the city of Gallup, one new pumping plant would be constructed, three pumping plants upgraded, five new storage tanks constructed, and 32 miles of pipeline upgraded. The upgraded Gallup Regional System would be connected to five Navajo Nation water distribution systems on the outskirts of the city.

The Cutter Lateral would be constructed to carry water from Cutter Reservoir (an existing feature of the NIIP) to the eastern portion of the Navajo and Jicarilla Apache Nations. A water treatment plant would be constructed at the base of Cutter Reservoir to deliver treated water to the relift pumps and pipeline that make up Cutter Lateral. Existing Navajo Nation water distribution systems would be connected to the pipeline, and a tee with a blind flange would be provided for a future connection by the Jicarilla Apache Nation. Primary project features and their purposes are shown in table I-3.

Table I-3.—Primary project features and their purposes

Component	Purpose	Total project number
River intakes	Draw water from the San Juan River	1
River pump plants	Pump San Juan River water to treatment plant	1
Treatment plants	Treat water from San Juan River and the NIIP	2
Forebay tanks	Provide water for operation of relift pumping plants	19
Pumping plants	Force water through pipelines	24
Regulating tanks	Moderate fluctuations in system pressures	5
Community storage tanks	Provide for fluctuations in the water users' demands	25
Pipelines	Transmit treated water to point of distribution	266.4 miles

A typical relift pumping plant has a forebay tank, pumps and motors within an enclosed building, an air chamber, and re-chlorination equipment. The forebay tank provides an adequate supply of water to minimize the number of times the pumps cycle on and off. The air chamber provides protection of the pumping plant and pipeline when the pumps are started and stopped. Re-chlorination equipment provides the required chlorine residual in the treated water. The turnout pumping plants have the same components as the relift pumping plants except that a storage tank replaces the forebay tank. Figure I-4 shows a schematic of the proposed project's order of operation.

San Juan Lateral Water Treatment and Pumping Plant

The San Juan Lateral water treatment and pumping plant would include seven ultrafiltration units, seven ultraviolet (UV) disinfection units, a 797,000-gallon water tank, two waste water ponds, two sediment drying beds, mixing and flocculation tanks, chemical storage buildings, an operation and maintenance (O&M) building, a four-unit

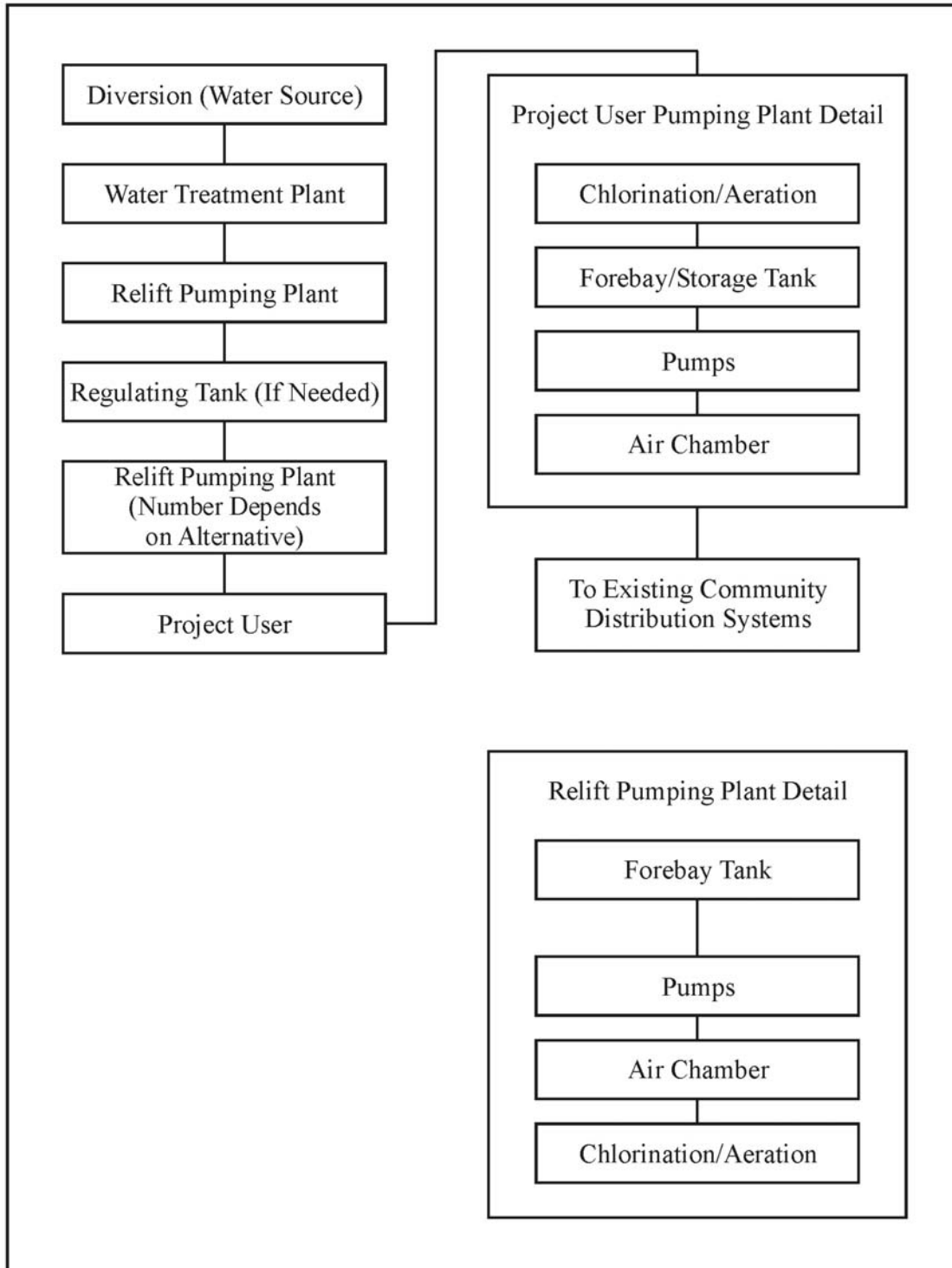


Figure I-4.—Typical schematic for the proposed project.

pumping station, and electrical control equipment. The capacity of the treatment plant would be approximately 38.25 million gallons per day (MGD) of water (59.19 cubic feet per second [cfs]).

The San Juan Lateral pumping plant would pump treated water into approximately 145 miles of buried 12- to 48-inch-diameter pipeline. From the pumping plant, the pipeline would cross the San Juan River upstream of the treatment plant and PNM diversion dam and ascend a mesa south of the river. From the mesa, the pipeline would extend west along the ROW of Navajo Highway 64 to U.S. 491. At U.S. 491, the pipeline would extend south along the highway ROW to Ya-ta-hey, New Mexico. At Ya-ta-hey, the pipeline would connect to spur waterlines extending to Window Rock and the city of Gallup. In the city of Gallup, one new pumping plant would be constructed, and three existing pumping plants, five storage tanks, and 32 miles of pipeline would be upgraded.

Seven booster pumping stations would be constructed along the San Juan Lateral. Each booster pumping station would occupy approximately 1 acre of land and would consist of a water tank, pumping plant, air chamber, chlorination building, and an electrical control structure. The San Juan Lateral would also include the construction of 17 water storage tanks, 3 water regulating tanks, junctions to the existing water supply systems, and a turnout to the NIIP and Navajo Nation chapters that do not have existing water supply systems.

The San Juan Lateral would serve the Shiprock, Burnham, Sanostee, Two Grey Hills, Newcomb, Sheep Springs, Naschitti, Tohatchi, Twin Lakes, and Mexican Springs Chapters. The Crown Point Lateral, which follows Navajo Route 9, would serve the Coyote Canyon, Standing Rock, Nahodishgish, Crown Point, Little Water, Becenti, Lake Valley, and White Rock Chapters. The Window Rock Lateral following Navajo Route 3 would serve the Rock Springs, Tsayatoh, St. Michaels, and Fort Defiance Chapters. The Gallup Junction Lateral would serve the city of Gallup and the Red Rock, Bread Springs, Chichillah, Manuelito, Church Rock, Iyanbito, Pinedale, and Mariano Lake Chapters. The proposed project would also include the construction of a new overhead electrical transmission line that parallels the San Juan Lateral pipeline and would provide power to the booster pumping stations.

The SJRPNM Alternative would also include construction of the Cutter Lateral pipeline. The Cutter Lateral would serve the Huerfano, Nageezi, Counselor, Pueblo Pintado, Ojo Encino, Toreon, and Whitehorse Chapters in the eastern portion of the proposed project area in New Mexico as well as the Jicarilla Apache Nation. The Cutter Lateral would originate at Cutter Reservoir and provide up to 4,645 AFY of water to the eastern service area. This lateral would include a water treatment and pumping plant that occupies approximately 3 to 4 acres of land. The Cutter Lateral water treatment and pumping plant would be smaller than the San Juan Lateral plant, but would contain much

of the same equipment. The plant would include three ultrafiltration units, three UV disinfection units, a 112,000-gallon subsurface pumping plant forebay, two waste water ponds, mixing and flocculation tanks, chemical storage buildings, an O&M building, a four-unit pumping station, and electrical control equipment. The capacity of the Cutter Lateral treatment plant would be approximately 5.39 MGD (8.34 cfs).

The Cutter Lateral pumping plant would pump treated water into approximately 89 miles of buried 10- to 24-inch-diameter pipeline. The Cutter Lateral would include the construction of five 1-acre booster pumping stations, three community water storage tanks, and two water regulating tanks. Similar to that of the San Juan Lateral, an overhead electrical transmission line would be constructed along the Cutter Lateral to power the booster pumping stations. A substation would also be constructed to provide power from an existing PNM transmission line to the newly constructed transmission line.

Cutter Dam and Reservoir

The Cutter Lateral would serve communities in the eastern portion of the Navajo and Jicarilla Apache Nations by delivering water from Cutter Reservoir via the outlet works (see figure I-3). Water in Cutter Reservoir comes from Navajo Reservoir through an existing intake structure and a series of tunnels and siphons that would be operated throughout the year under the proposed project. The Cutter water treatment plant would deliver treated water to a pumping plant, which would then pump the water into Cutter Lateral for transmission to the various communities.

Service to Municipal Subareas

The 2040 population of the Navajo communities (1990 population with 2.48 percent annual growth rate) was used with an average daily water demand of 160 gpcd to determine the average daily demand. Surface diversion required for the proposed project was the average demand minus the available groundwater sources in each of the subareas. Supporting information can be found in volume II, appendix A. Peak daily demand was computed by multiplying the surface diversion for the proposed project by a 1.3 peaking factor. The peaking factor was derived from a 7-day average in mid-July. Navajo Nation communities that have an existing water distribution system would have a storage tank and a method to increase (by means of a turnout pumping plant) the pressure for proper distribution. Delivery locations in the transmission line that do not have an existing water distribution system would be provided with a tee and a blind flange for future use. The proposed project would connect to approximately 31 existing Navajo Nation municipal systems and would provide a pressure of 70 pounds per square inch at those

locations. The storage capacity for each of the municipal systems was based on the individual service area 5-day demand for the year 2020 for those communities with existing water distribution systems.

The city of Gallup and Jicarilla Apache Nation surface diversion requirements are 7,500 and 1,200 AFY, respectively, for all years in the proposed project. An independent analysis (volume II, appendix B) conducted by the city of Gallup identifies the system requirements for the city and the surrounding Navajo communities served by the Gallup Regional System. No storage is provided for the Jicarilla Apache Nation.

WATER TREATMENT CONSIDERATIONS

Water Quality

Water from the Navajo Indian Irrigation Project

The water source for the Cutter Reservoir diversion is Navajo Reservoir. The water quality parameters, shown in table I-4, indicate that the only treatment requirements are filtration and disinfection as required under the Surface Water Treatment Rule (SWTR), which is part of the Safe Drinking Water Act (SDWA). Further sampling and analysis would be required before final design and construction to verify that the data presented in table I-4 are correct, especially during low- and high-precipitation years.

Table I-4.—Water quality (NIIP source water)

Parameter	Average ¹	Design range	Secondary maximum contaminant level (MCL) ²
Electrical conductivity (umhos/cm)	195	205-187	
pH	7.72	7.75 – 7.71	
Temperature (degrees Fahrenheit)	46.7	49.1 – 45.3	
Turbidity (NTU) ³	2.6	3.16 – 1.47	
Total suspended solids (mg/L) ⁴	1.15	1.3 – 1	
Total dissolved solids (mg/L)	154	181 – 140	500
Sulfates, SO ₄ (mg/L)	32.5	38.2 – 2.29	250
Total organic carbon (mg/L)	4.47	8 – 2.29	
Chlorides (mg/L)	1.6	1.9 – 1.2	250

¹ Data from three samples collected from the Cutter diversion April 2000 to June 2000.

² Secondary standards for MCLs are established by the Environmental Protection Agency for control of aesthetic qualities relating to public acceptance and include contaminants that may affect taste, color, odor, and appearance.

³ Nestler Turbidity Units.

⁴ Milligrams per liter.

San Juan River Diversion

The San Juan River, upstream of the PNM diversion, would provide water to the SJRPNM water treatment plant. Table I-5 provides water quality parameters. As shown, the water quality meets all primary standards established by the Environmental Protection Agency (EPA) for the parameters shown, resulting in the need for filtration and disinfection to meet the requirements of the SWTR. Several samples exceeded the total dissolved solids (TDS) and sulfates secondary standards. Sulfates and TDS are constituents that cannot be substantially reduced by the proposed ultrafiltration system. Further investigation is required to confirm the reduction of water quality due to the increase of TDS and sulfates associated with storm water runoff flows at the SJRPNM diversion points. Since this water cannot be treated by the proposed system, the following operation scenarios are suggested during major runoff events:

Table I-5.—Water quality (San Juan alternatives)

Parameters	PNM historic ¹		Design ²	
	Average	Range	Range	Secondary maximum contaminant level (MCL) ³
EC (umhos/cm)	538	1,102 – 276	632 – 214	
pH	8.1	8.7 – 7.7	8.7 – 7.6.	
Temperature (degrees Fahrenheit)	53	71 – 32.2	75 – 33	
Turbidity (NTU) ⁴	166	1055 – 8	200 – 5.4 ⁵	
Total suspended solids (mg/L) ⁶	876.6	1080 – 21	262 – 21	
TDS (mg/L)	362	772 – 145	1000 – 24	500 ⁷
SO ₄ (mg/L)	140	322 – 65	200 – 38	250
TOC (mg/L)	5.7	10.5 – 2.9	4.76 – 2.89	
Chloride (mg/L)	14	23 – 6	26.6 – 2.91	250
T. hardness (mg/L)	163	232 – 84	232 – 84	

¹ Data for PNM is based on 34 samples collected at the diversion point between February 2003 through July 1, 2005.

² Design value for total suspended solids incorporates the reduction of turbidity and suspended solids by the pre-treatment settling pond.

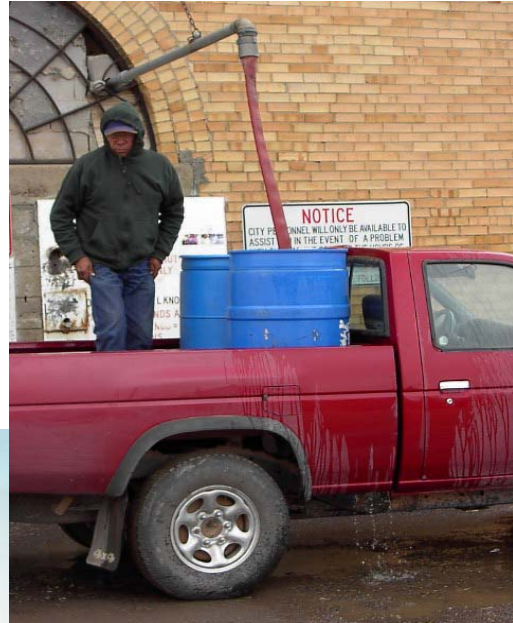
³ Secondary standards for MCLs are established by EPA for control of aesthetic qualities relating to public acceptance and include contaminants that may affect taste, color, odor, and appearance.

⁴ Nestler Turbidity Units.

⁵ All source water with a turbidity of over 200 NTU will need to be pre-treated by diversion through the settling ponds.

⁶ Milligrams per liter.

⁷ State of New Mexico secondary MCL for TDS is 1,000 mg/L.



Water hauling is necessary for a quality water supply in parts of the Navajo Nation.

- Significant dilution may be provided in the SJRPNM settling ponds to reduce TDS and sulfate concentrations to below maximum contaminant level (MCL) limits.
- Storage capacity in the settling ponds, waste water polishing ponds, and treated water distribution system may be adequate to temporarily stop diverting water from the San Juan River to the treatment plant during large storm events. Once the concentrations of TDS at the diversion intakes are below 500 parts per million (ppm) TDS and 250 ppm sulfate, diversion of San Juan River water can resume.

Water Treatment

The water source for the SJRPNM Alternative is surface water from the NIIP and the San Juan River. The treatment systems used to provide drinking water to the consumers must comply with the SWTR.¹ The filtration and disinfection requirements under this rule protect consumers against the potential adverse effects of exposure to *Giardia lamblia*, *Cryptosporidium*, viruses, *Legionella*, and heterotrophic bacteria by requiring the inactivation of 99.9 percent (3 log) for *Giardia* cysts and 99.99 percent (4 log) for viruses.

The inactivation of potential pathogens, as required by the SWTR, is accomplished by the use of EPA-approved technologies for filtration and disinfection methods. Newly adopted regulations to address the risk of disinfection byproducts (DBPs) include the Disinfectants - Disinfection Byproducts Rule and the Interim Enhanced Surface Water Treatment Rule, which requires continual monitoring of filtered water turbidity and routine DBP levels in the distribution system.

The relatively high concentrations of total organic carbons (TOC) in samples from the NIIP and San Juan River water sources, as shown in tables I-4 and I-5, in combination with the long detention times required to convey the treated water to some of the delivery points, indicate a potential for the production of DBPs that may exceed current and future regulatory limits at the treated water service points or within the domestic water storage and distributions systems used to distribute the water to consumers. In order to determine the expected reduction in TOC concentrations by the proposed treatment system and the potential of DBPs production over time, bench-scale distribution simulation studies using chloramine and free chlorine disinfection should be done. If bench scale analysis indicates that the DBP limits are exceeded, additional treatment systems to remove the DBPs before consumption may be required in some locations.

Description of the Proposed Water Treatment System

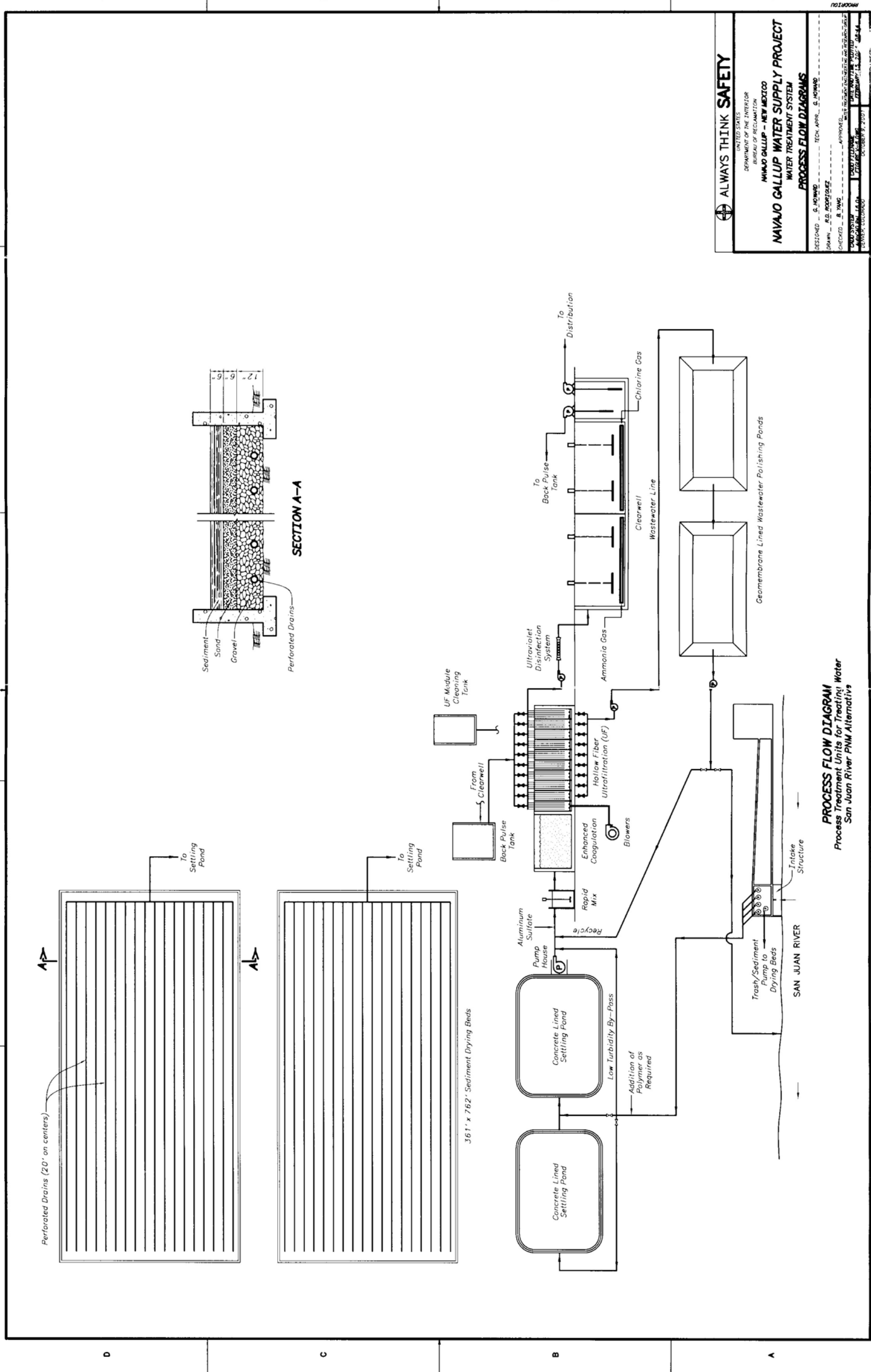
The proposed water treatment system consists of enhanced coagulation, ultrafiltration, and ultraviolet disinfection to provide multiple treatment barriers for removal of organic molecules, *Giardia*, *Cryptosporidium*, and viruses. The use of chloramines to provide a disinfection residual during the conveyance of treated water from the treatment plant to the service areas will not only provide treated water that is not conducive to the formation of disinfection byproducts, but will also provide an additional disinfection barrier. Figure I-5 illustrates the proposal. Before final design and construction, a

¹ The SWTR was published in the *Federal Register* on June 29, 1989, and is promulgated by EPA as a National Primary Drinking Water Regulation for public water systems using surface water sources or groundwater under the direct influence of surface water.

ALWAYS THINK SAFETY
 UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
NAVAJO GALLUP WATER SUPPLY PROJECT
WATER TREATMENT SYSTEM
PROCESS FLOW DIAGRAMS

DESIGNED - S. MORRIS TECH. APPR. - S. MORRIS
 DRAWN - R.D. ROYALSKIE
 CHECKED - B. YANG APPROVED -
 CADD SYSTEM - J.A.H. DATE OF PLOT - JANUARY 13, 2011 JOB # - 48-44
 SHEET NO. 1-5 SHEETS TOTAL - 1-54
 REVISED - NOVEMBER 8, 2010

1 Figure I-5



PROCESS FLOW DIAGRAM
 Process Treatment Units for Treating Water
 San Juan River PNM Alternative

2

3

4

5

1

2

3

4

5

comprehensive pilot-scale operation of each process will be required to verify the effectiveness and operation of each unit process and resultant water quality.

Water Treatment Plants.—The proposed water treatment plants primarily include buildings that would house most of the water treatment features already described. Figure I-5 displays the water treatment plant structures (all plant structures, except intakes, must be located above the 100-year flood plain).

Main Treatment Building – The main treatment building would be approximately 24,500 square feet with a second floor mezzanine that would be approximately 22 feet wide and 122 feet long. The proposed building would be a pre-engineered, pre-fabricated structure with metal siding and suitable insulation and ventilation to meet the building code requirements of the State of New Mexico and all other applicable code requirements. The building would house the 10-foot-tall flocculation basins, 10-foot-tall concrete tanks containing the ultrafiltration modules for each train, UV units, vacuum pumps, and internal piping. The second floor mezzanine would contain the control room for the filters and UV units, air blowers used for module cleaning, and the motor control center. The chlorine storage room and ammonia storage room would be included in the main building, but would have outside entrances and separate heating, ventilation, and air conditioning (HVAC) systems to eliminate the risk to the operators if leakage occurred in any of the cylinders. The building is designed to house the treatment system required to meet 2040 demands.

The chlorine and ammonia storage room would house the 1-ton containers of each gas along with the chlorinators and ammoniators, which would meter the gases into the clear well for mixing. Trunnions are provided in the storage room to provide for the storage of full containers to meet a 2-month demand along with spare trunnions for storage of an equal amount of empty or full containers.

NIIP Cutter Diversion Treatment Plant – The Cutter diversion water treatment plant is a scaled-down version of the main treatment plant, with a building area of approximately 4,600 square feet. Like the larger plant, the flocculation basins would be located inside the building to protect the water from windblown sand and freezing temperatures. Due to its reduced size, all treatment components for the Cutter treatment plant would be located on a single floor.

Regional O&M Buildings – The preferred alternative (SJRPNM) includes a 2,500-square-foot regional O&M building located within the treatment plant compound. Buildings would be on a slab on grade with 15-foot eave heights. The facility would be used for spare equipment/parts storage and for maintenance areas relating to the treatment, conveyance, and pumping of water for the proposed project.

Clear Well – The below-grade clear well would provide a detention time of 30 minutes and would include injection manifolds, baffles, and mixers to properly mix ammonia and chlorine with treated water. After chloramination, the treated water would be pumped by the service pumping station into the distribution system.

Waste Water Storage/Treatment Ponds – Water generated during the routine cleaning of the filters would flow into one of two passive treatment ponds. In these ponds, fine suspended solids filtered by the hollow fiber system would be settled out and removed from the site. After passive treatment, the water could be conveyed back into the treatment plant, discharged back into the source, or discharged to surface waters. The useful life of a pond is estimated to be between 10 to 15 years before settled sediment would need to be removed and conveyed to the sediment drying beds. Each pond would be lined with a 45-mil-thick geomembrane system to reduce the impact on regional groundwater.

Sediment Drying Beds – With the construction of a new diversion upstream from the existing PNM diversion dam, all sediment removed by the intake structure and settling ponds would have to be retained and ultimately disposed of off-site. The determination of the frequency of pond cleaning, volume of sediment, volume of dried sediment, size of required sediment drying beds, and resulting O&M costs in this report was based on one water quality sample taken during one storm event. This event occurred on August 23, 2000, and analyses indicated a turbidity reading over 23,000 Nestler Turbidity Units (NTU) units and a suspended solids loading of over 15,000 milligrams per liter (mg/L). The drying bed size and costs should be taken as preliminary because additional sampling and analyses would be required prior to design and construction. Using this data point, the lead pond would need to be dredged of sediment after every 10 days of storm runoff, and two sediment drying beds with a surface area of approximately 6 acres each would be required. When the sediment in the 10-foot-deep lead pond became 2 feet deep, approximately 130,000 cubic feet of sediment would need to be removed and placed on one of the drying beds. The excavated sediment would be applied at an approximate depth of 6 inches on the surface of each bed.² The system would remove water from the sediment by drainage and evaporation, reducing the water content by approximately 50 percent with a dried sediment depth of 2.5 to 3 inches. Once dried, the sludge would be removed from the top of each bed and transported to a nearby abandoned open pit coal mine for final disposal. O&M costs associated with excavation and transport of sediment collected from the settling ponds are based on two cleaning cycles per year.

Sediment Removal Ponds – The settling basins considered in this alternative are required to reduce turbidity of the San Juan River water before treatment. Most of the

² Beds consist of perforated polyvinyl chloride pipes located in a gravel under-drain system. Sand would lie on top of the gravel.

sediment contained in the source water would be removed by the intake and the proposed settling ponds. Each pond is designed with a 3-hour detention time, providing optimum conditions for the reduction of turbidity to acceptable limits before treatment by the enhanced coagulation and ultrafiltration systems. Settling tests using San Juan River water (collected during a high turbidity of 4,266 NTU) have verified that a two-pond system with each pond to provide a detention time of 3 hours would be sufficient to reduce turbidity to acceptable limits before treatment. The settling basins would have minimal effects on the quality of the water, with the exception of some dilution of high TDS and sulfate concentrations occurring during high runoff conditions. To reduce the impact of the ponds on regional groundwater through infiltration, and to avoid the need to replace the liner after each sediment removal event, each pond would be lined with 6 inches of reinforced concrete. The settling pond(s), sized to meet the hydraulic requirements for the demand year 2040, are based on a 6-hour detention time and have the following specifications:

- Influent flow rate of 38.25 MGD
- A required volume of 9,653,000 gallons in settling pond(s)
- A surface area of 1.72 acres with a 10-foot depth and 1:1 side slopes

Source water from the NIIP would not require settling basins because the water would have already passed through a large surface impoundment that acts like a settling basin.

Enhanced Coagulation – In waters that have variable annual turbidity or moderate-to-high TOC concentrations, ultrafiltration systems typically include an enhanced coagulation step prior to filtration to coagulate small suspended materials in the water and to increase the filtration efficiency. This process increases the removal of organic matter before disinfection to meet the requirements of the Stage 1 and Stage 2 DPB Rule. This pre-treatment process uses aluminum sulfate or other coagulants in such a manner that the type and dosage can only be determined by laboratory and field tests (assuming aluminum sulfate would be the coagulant of choice and the required concentration would be 30 mg/L).

Hollow Fiber Ultrafiltration Treatment System – Previous studies have evaluated the potential for using conventional, diatomaceous earth and microfiltration/ultrafiltration for the treatment of surface waters associated with this project. A discussion of these studies is included in volume II, appendix A, section 8.5. Based on this analysis, ultrafiltration using hollow fiber membranes along with enhanced coagulation is the proposed method for filtration because the system is (1) able to treat water with varying turbidity, (2) able to meet current and future regulatory standards, and (3) easy to operate and maintain.

The hollow fiber ultrafiltration treatment system physically removes suspended particles greater than 0.1 micron in diameter by having a nominal and absolute pore size of 0.035 and 0.1 micron, respectively. Particles found in surface water that exceed this size

range are easily filtered. These particles include Giardia (5–15 microns in size), Cryptosporidium (4–6 microns in size), large viruses, and large organic molecules. The continuous hollow fiber ultrafiltration system manufactured by US Filter (CMF-S) or Zenon (ZeeWeed) are bundles or cassettes of tubular membranes that filter water through microscopic holes. Designed for large-scale systems, the pre-engineered cassettes are submerged into open-top concrete or steel tanks.

Ultraviolet Disinfection Units – Disinfection after ultrafiltration would be accomplished by state-of-the-art flow-through UV disinfection units that are located on the filtered water discharge line from each ultrafiltration treatment train. Each unit would consist of a stainless steel chamber containing eight UV lamps, an automatic cleaning system, a UV monitoring system, and a control cabinet. Each unit would provide a minimum UV dose of 40 microjoules per square centimeter to the filtered water before being routed to the clear well.

The proposed UV units would add an additional 3 log (99.9 percent) reduction of Giardia and Cryptosporidium and an additional 4 log (99.99 percent) reduction in viruses to the water following the ultrafiltration process. Based on this information, the unit processes of ultrafiltration and UV disinfection would provide a reduction of 9 log for Giardia and Cryptosporidium and 6 log for viruses. This reduction would far exceed the SDWA requirements.

Chloramination – The mixing of filtered and disinfected water with ammonia gas followed by chlorine gas in the clear well would provide a chloramine residual prior to being pumped by the service water pumping plant into the treated water mains leading to the service areas. This form of residual is being used to reduce the development of DBPs that would be generated by extended contact times in the conveyance and storage facilities if a free chlorine residual were used. Other benefits of a chloramine residual include prevention of taste and odor problems and the fact that the chloramine residual would last longer in the treated water transmission line and storage system, thus eliminating the number of re-chloramination stations (Reclamation, 2002).

Other Treatment Components.—

Chloramine Booster Stations – Each pumping plant would contain a chloramine booster station that would monitor the chloramine residual of the incoming water and automatically add, as required, additional chlorine to maintain the 0.5 ppm residual to the water being pumped by the plant. The capital and O&M costs of these re-chloramination systems are included as part of the unlisted items in the water treatment cost estimate.

Water Blending – Blending of good water quality produced by the proposed surface water treatment plants with low quality groundwater presently used by the city of Gallup and many of the Navajo Nation communities may increase turbidity in the mixed water.

Increased turbidity, a secondary MCL, in the blended water would decrease the aesthetic quality of the water. In order to predict and compensate for any reactions, a detailed water quality analysis for each well system is required. These data would then be used in the “Rothberg, Tamburnini & Windsor Model for Corrosion Control and Process Chemistry” or a similar model to predict turbidity formation. If the modeling determines chemical addition(s) are required to eliminate the formation of turbidity, followup laboratory verification is required. In order to provide funding for modeling and potential chemical injection systems, a 10-percent unlisted additive is included in the capital cost for each treatment system and each demand. To account for potential O&M costs of these systems, a 10-percent miscellaneous additive is provided.

Disinfection Byproduct Treatment – Included in the unlisted percentage in the capital cost for each alternative is funding for the installation of aeration systems and re-chlorination systems at each service point to remove DBPs that may be created during conveyance.

Pilot Plant Operation – Prior to final design of the selected alternative, a pilot study using the proposed treatment system would be required to optimize each treatment process and collect design data. The pilot plant should operate 24 hours a day over a minimum of 12 consecutive months to determine treatment requirements with changing water conditions. A line item providing a sum of \$200,000 to fund the pilot study is included in the capital cost. The study would provide or determine:

- The most efficient chemical to use for coagulation
- Chemical injection rates based on changing water quality
- Backwash requirements and membrane cleaning requirements
- Waste water quality and production rates
- The potential for DBP formation during conveyance
- Operation requirements
- The ability of the treatment system to meet current and future regulatory standards
- Data to update capital and O&M costs
- Training for future operators on the full-scale treatment system

Operation.—The overall operational system would monitor the demands in the treated water distribution system and activate/deactivate the treatment system to maintain required water levels or pressures in the treated water storage tanks. When in operation, the water treatment system master control panel would control the local control panels (LCP) for each treatment process. During automatic operation, the water treatment master control system monitors all LCPs and provides inputs for adjustments for optimal treatment efficiency. Operators would be required to monitor operations 24 hours a day,

along with routine duties such as calibrations of turbidity meters, chemical injection equipment, residual monitors, inventory control, and monthly reports. This control system would be integrated into the overall project control system.

Plant Operators.—Plant operation for all treatment plants and all demands would require a total staff of six personnel (four operators, one maintenance person, and one supervisor). The staff would ensure that at least one operator was at the plant during operation with suitable maintenance and supervisory support.

Chemicals.—Chemicals required include those for routine cleaning of the hollow fiber membranes, aluminum sulfate to flocculate the small suspended particles in the source water, and chlorine and ammonia gas to form a chloramine residual to keep the water disinfected during its transport from the treatment plants to service.

Power.—The annual cost for power to operate each plant would include power to operate vacuum pumps, air compressors, UV disinfection units, low-head lift pumps, lights, and HVAC units and a percentage increase for other loads required for operation of a large water treatment facility. For the Cutter diversion, a low lift pump would divert water from the waste water polishing ponds to the plant influent for recycling. Three low-head lift stations would be required for the SJRPNM component—one to transfer water from the river diversion to the settling ponds, one to transfer water from the settling ponds to the water treatment plant, and one to recycle water from the waste water ponds to the water treatment plant. To provide uninterrupted treated water, the New Mexico Environmental Department requires backup generators to be provided for all potable water treatment plants. These generators need to be rated to meet the power requirements during the average daily flow or 70 percent of the design flow.

Replacement of Equipment.—Annualized equipment replacement costs include annual replacement of UV light bulbs, the replacement of all hollow fiber cassettes every 10 years, and the replacement of mechanical equipment every 15 years. Details on the annualized cost of each are provided in volume II, appendix B.

Dredging and Disposing of Sediment.—When the settling and waste water polishing ponds contain a maximum of 2 to 3 feet of sediment, a dragline would be used to remove the sediment in the SJRPNM settling pond and each of the waste water polishing ponds. The sediment would be dried on the sand drying beds and, when dry, would be transported off-site for disposal. The estimated frequency for dredging and disposing of sediment is every 10 days of storm runoff for the SJRPNM lead settling pond and every 15 years for the waste water polishing pond.

PROJECT LAND, RIGHTS-OF-WAY, RELOCATIONS, AND DAMAGES

The proposed pipeline corridor needs a 60-foot-wide permanent ROW and a 150-foot temporary ROW (the total length of the pipeline is approximately 262 miles). Of this corridor, 8 percent is allotted Navajo Land, and 57 percent is Navajo Reservation Fee and Trust Land. The remainder is divided among a number of State, Federal, and private ownerships. The distribution of the land status is shown in table I-6. Existing utility ROW will be used where possible.

Table I-6.—Land status of the Navajo-Gallup
water supply pipeline

Land status	San Juan River Alternative (miles)
Main Navajo Reservation	126
Checkerboard area	
Bureau of Land Management	39
Indian allotment	22
Navajo Fee land	11
Navajo Trust land	12
Private	36
State	13
Other	4
Total	262

The Navajo Nation Department of Natural Resources recommended that project parameters assume that the ROW within the Navajo Nation would be donated with no direct cost. Damages and necessary relocations associated with facility construction would be a project cost. It is also assumed that there would be no direct project costs for ROW on Federal and State land. The Navajo Nation requires that an appraisal of the proposed ROW be conducted. This evaluation is based on the beneficial use of the land and the value of the product in the pipeline. The fair market value of the corridor through the allotted land is between \$240,000 and \$480,000, and the fair market value of the corridor through Tribal Trust Land is between \$14.1 and \$23.5 million.



Pipeline construction.

As described in the Code of Federal Regulations 25 Part 169 – Rights-Of-Way Over Indian Lands, the Bureau of Indian Affairs (BIA) has a multi-step process for establishing ROWs across Trust Land (information on the specific procedures is available from BIA). Depending on the number of Indian land allotments crossed by the proposed project corridor, the ROW procedures may be complicated. The land affected must be appraised, the individual allotment owners must be contacted and informed, and consents for the proposed project must be obtained. This process could take 18 months or longer. The cost of this process is included in the non-contract costs associated with the proposed project.

Depending on the specific pipeline location, approximately 36 miles of the alignment could be on private land. It is assumed that there would be no direct project cost for obtaining this ROW.

The water treatment plant at the San Juan River diversion is to be located on private land. A 20-acre piece of land would be required. Six families will be re-located and their houses and land purchased at fair market value.

Cultural Resources

Although the SJRPNM Alternative is decidedly less impacting to cultural resources than the NIIP alternatives, significant impacts would result from the proposed project. An analysis predicts that approximately 104 historic properties would exist in the Area of Potential Effects of the preferred alternative. Of the 104 properties, it is anticipated that approximately 83 of them would require some level of mitigative treatment—either archeological testing or full data recovery. The contract costs for performing such work (as estimated in December 2002) are estimated at \$5.7 million. Other cultural resource costs include ethnographic investigations; identification and evaluation of in-use areas; non-contract (administrative) costs; consultation with Navajo Nation chapters and State, Tribal, and Federal entities; Native American Graves and Repatriation Act repatriation; unanticipated contingencies; and museum curation of cultural materials. Therefore, the total cost of a cultural resources program is estimated to be a maximum of 4% of the total project cost, \$34.5 million (based on January 2007 prices). Other projects in the region, the Dolores and Animas LaPlata Projects, have needed this level of cultural resource program funding.

Environmental Mitigation

The construction of the proposed project diversion, treatment plant, pumping plant, and pipeline within the San Juan River Valley would impact approximately 25 acres of riparian and wetland area. Assuming a 3:1 mitigation ratio, 75 acres of similar adjacent land would be purchased or a permanent ROW obtained. This land's riparian and wetland characteristics would be enhanced through land management (i.e., fencing, grading, weed control, and planting vegetation).

Construction of the proposed project pumping plants and storage tanks along the pipeline would impact approximately 50 acres. It is anticipated that an equal number of adjacent lands would be improved through range enhancement (i.e., fencing, seeding, and constructing wildlife watering stations). Construction of the Cutter Lateral treatment plant and pumping plant would impact approximately 10 acres. It is anticipated that an equal number of adjacent lands would be improved through seeding, fertilizing, and mulching. Pipeline construction would impact an area up to 300 feet wide along the pipeline alignment. It is anticipated that this area would be re-seeded, fertilized, and mulched to restore the vegetation. This re-seeding would occur as sections of the pipeline are constructed.

CAPITAL AND OM&R

Project Construction, Ownership, and OM&R

Project facilities would be constructed through Reclamation. Ownership of all of the proposed project facilities would remain with Reclamation until a point in the future when the Navajo Nation and the city of Gallup would be capable, by mutual agreement, of taking over ownership. Until facilities are transferred from Reclamation, project OM&R would be the responsibility of Reclamation through contract to the Navajo Tribal Utility Authority (NTUA) and the city of Gallup. The costs of OM&R would be paid by the NTUA and the city. This arrangement would be detailed in an agreement among the entities. It is anticipated that the entire project's ownership and OM&R responsibility would be transferred to the Navajo Nation and the city of Gallup. The Jicarilla Apache Nation would pay its share of the project's OM&R costs and be party to all agreements pertaining to this proposed project's ownership and OM&R.

The appraisal design and construction cost estimate was provided by Reclamation's Denver Technical Service Center (TSC). This information was documented in the *Appraisal Level Designs and Cost Estimates Report*, April 2002 (volume II, appendix B). A peer review of the designs and cost estimates was performed by Boyle Engineering Corporation in February 2004. Based on results from this review and using current unit costs of materials, the TSC revised the proposed project construction cost estimate in April 2007. A summary of this April 2007 cost estimate is shown in table I-7 (based on January 2007 dollars).

Reclamation historically supports projects for construction after a feasibility report is completed, which includes a feasibility-level cost estimate. This appraisal-level cost estimate does not meet that requirement. Additional analysis, detail, and updates of the appraisal-level cost estimates presented in this planning report and final environmental impact statement are needed before project construction authorization can be supported. Failure to complete this additional effort may result in reliance on a cost estimate for the proposed project that is not sufficient to characterize the expected cost. The appraisal-level design must be upgraded to feasibility level before Reclamation would begin construction. The cost of, and time for, completing this additional work would be substantial.

OM&R costs include electrical power, chemicals for water treatment, repair and replacement of components of the facilities, and personnel required to operate the system. Power costs were calculated using the January 2007 costs from the local power provider, NTUA, and the Colorado River Storage Project (CRSP). This analysis also included estimating the cost using power from the CRSP, and the economic analysis used NTUA and CRSP power rates for comparison purposes. Table I-8 details the OM&R costs.

Table I-7.—Preferred alternative cost estimate

Feature	Reclamation April 2007 ¹ cost estimate (\$)
Pipelines	202,546,620
Pumping plants	28,355,000
Water treatment plants	53,673,055
Tanks and air chambers	85,575,000
Transmission lines	26,677,200
Turnout structure	1,707,380
Gallup Regional System	25,754,500
<i>Subtotal</i>	424,288,755
Mobilization (5%)	21,000,000
Unlisted items (10%)	44,711,245
<i>Subtotal</i>	490,000,000
Contingencies (22.5%)	110,000,000
<i>Subtotal (field costs)</i>	600,000,000
Noncontract costs (27%)	162,000,000
<i>Subtotal</i>	762,000,000
New Mexico taxes on field costs (estimated at 6%)	36,000,000
Navajo Nation taxes on field costs, excluding Gallup Regional System field cost of \$30 million (estimated at 3%)	16,900,000
<i>Subtotal</i>	814,900,000
Land, relocation, and damage ²	9,000,000
Cultural resource mitigation	34,500,000
Environmental mitigation	6,000,000
Total project cost	864,400,000

¹ The cost analysis contained in this PR/FEIS is at an appraisal level using January 2007 prices, and it was completed before project authorization (P.L. 111-11) was enacted. Public Law 111-11 authorizes \$870 million of appropriations, plus indexing, for the proposed project. It also limits the Secretary to not more than 2 percent of construction costs for cultural resource mitigation costs. This limitation would reduce the above costs by \$17.5 million. The proposed project is now authorized, and more refined construction cost estimates will be prepared in the future with more detailed design data. Therefore, for this PR/FEIS, previously developed cost estimates will be used (the change described above is within the range of accuracy for the total cost estimate and the effort required to make numerous, small revisions is not warranted at this level of study).

² The estimate includes right-of-way (ROW) costs for the San Juan Treatment Plant only; should it be determined that additional ROW needs to be included, additional funds will be necessary.

Table I-8.—Yearly OM&R costs (\$) (SJRPNM Alternative)

Item	San Juan Lateral	Cutter Lateral	Gallup Regional System
NTUA power costs (relift pumping plant)	4,962,000	597,000	82,000
CRSP power costs (relift pumping plant)	1,841,000	221,000	31,000
NTUA power costs (booster pumping plant)	215,000	35,000	
CRSP power costs (booster pumping plant)	80,000	13,000	—
Relift pumping plant OM&R	3,170,000	1,245,000	723,000
Booster pumping plant OM&R	78,000	12,000	
Canal OM&R	—	35,000	—
NTUA power cost water treatment plant	511,000	63,000	—
CRSP power cost water treatment plant	187,000	22,000	—
Water treatment OM&R	2,605,000	1,064,000	—
NTUA water treatment, miscellaneous 10%	312,000	113,000	
CRSP water treatment, miscellaneous 10%	279,000	109,000	
Power transmission OM&R	350,000	Included in San Juan Lateral	
Pipeline OM&R	801,000	187,000	57,000
Total NTUA	13,004,000	3,351,000	862,000
Total CRSP	9,391,000	2,908,000	811,000
Relift pumping plant power consumption (kilowatts [kW])	16,219	2,026	305
Booster pumping plant power consumption (kilowatts)	784	128	
Water Treatment Plant power consumption (kilowatts)	1,588	224	
Total kW	18,592	2,379	305

Notes: (1) CRSP rate is 10.43 mils/kilowatthour and demand charge of \$4.43 per kW/month.
 (2) CRSP total project power cost is \$2,395,000.
 (3) NTUA rate is 20 mils/kilowatthour and demand charge of \$16.50 per kW/month.
 (4) NTUA total project power cost is \$6,465,000.
 (5) Cost reflects April 2007 project cost estimate with January 2007 price level.

Construction and Associated Costs

Interest During Construction

A project construction schedule was developed to support the economic analysis and help the proposed project beneficiaries plan future water supplies. The first objective of the

schedule was to provide water to people in the shortest time period to get the earliest possible benefit from the proposed project. Consideration was given to constructing Cutter Lateral first to give the operators some years of experience operating a smaller scale facility before operating the very similar but larger facilities of the San Juan Lateral.

The Cutter Lateral would be constructed first. The San Juan Lateral from Twin Lakes to Window Rock and the Gallup Regional System would be next. This section of lateral would draw groundwater from the Twin Lakes area until surface water would be available from the San Juan River. The San Juan Lateral from the San Juan River to Twin Lakes and to Crownpoint would be the last segment constructed.

A construction schedule was developed based on the assumed limitation of \$60 million in appropriations annually until project completion. The schedule shown in table I-9 shows the assumed yearly expenditures by feature from project construction start to finish. The schedule was used to estimate interest accrued on potentially borrowed money during construction and to estimate when people would receive water—the start of project benefits.

Cost Allocation

The purpose of cost allocation is to assign shares of the overall project costs to the various participants. The proposed project would provide municipal water supplies to three participating groups—the Navajo Nation, the city of Gallup, and the Jicarilla Apache Nation. The overriding philosophy in allocating project costs is that the three participants are equal partners in the proposed project.

Costs are separated into capital, fixed OM&R, and variable OM&R costs. Each of these cost categories is further divided into specific project reaches and then allocated to the participating parties. The analysis assumes that construction would begin in 2011, with a construction budget of approximately \$60 million per year, and full project completion by January 1, 2027. The details of the cost allocation are documented in volume II, appendix D.

In allocating costs, specific project components were separated out by those that would be dedicated for the exclusive use by any single participant; the cost of those ***dedicated components*** was assigned to the beneficiary participant. These dedicated components typically include water storage tanks and pressurization pumps at most of the major delivery points. The bulk of the proposed project cost, however, is for components that would benefit more than one participant. These joint costs were allocated among the project participants to derive each participant's share of the total costs.

Joint costs were allocated according to the following principles:

- **Capital costs were allocated according to each participant's share of design capacity.** The idea is that the size and cost of the facilities depend on each participant's desired capacity and not on average use or use in any particular period.
- **Fixed OM&R costs were also allocated according to each participant's share of design capacity.** Here again, the fixed OM&R costs (staff size, dredging, equipment replacement, and pump maintenance) are primarily a function of the design capacity, not of flows in any particular period.
- **Variable OM&R costs were allocated according to each participant's share of annual water deliveries.** The variable OM&R costs consist mainly of energy and water treatment chemical costs. These costs vary according to the water flows in any period, so the method used to allocate these costs assigns cost shares in each year according to the projected use in that year.

The proposed project envisions water deliveries at many locations along two main laterals. Every delivery changes the relative shares of the water flow that continues along the pipeline beyond the delivery point. Because, as described above, the relative share of design capacity and projected flow serve as the basis for the cost allocation, the cost allocations change after every delivery point. Therefore, each pipeline branch has been separated into specific *reaches* that are defined as the intervals between each two succeeding delivery points. The diversion structure and water treatment plant on each branch is also treated as a separate segment or reach. Each participant's share of design capacity on each reach was computed in order to serve as the basis for allocating capital and fixed OM&R costs.

Gallup Regional System Costs

The design work and cost estimates for the Gallup Regional System were first prepared by DePauli Engineering (DePauli Engineering and Surveying Company, 2002). Reclamation used the DePauli design but re-estimated much of the cost. Some of the Gallup Regional System components were included in Reclamation's cost estimates for the overall system (e.g., Navajo Nation chapter water storage tanks), but most components were listed separately as Gallup-specific. The components included with the other Reclamation elements were treated as part of the overall system cost allocation. The remaining items (all joint facilities) were allocated by their cost to participants based on their respective shares of design capacity. The OM&R costs were estimated as

Table I-9.—Construction schedule (cost in \$ millions)
(\$60 million/year schedule)

Construction phase	Year																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Navajo-Gallup Water Supply Project	2.35	4.29	22.32	11.91													40.86
Cutter Lateral	5.99	7.53	4.27	16.20	16.14	21.72	21.70	17.19	7.41								118.14
Twin Lakes/Window Rock	0.78	0.21				19.94	30.76	2.23									53.92
Cutter Power	0.72	0.73	0.73		3.00	3.27	6.60	9.59									24.63
San Juan Power		0.78	1.57					6.00	18.26	0.00							26.61
Gallup Regional System	0.40	4.37	20.33	26.66	28.09												79.85
San Juan Lateral		8.47	3.63		7.78	15.07	0.94			33.18	32.74	53.00	60.00	54.31	57.03	34.91	361.04
San Juan Pumping Plant		3.51	1.16					8.16	16.00		8.48	7.00		5.69	2.97		52.97
San Juan Water Treatment Plant	5.33	2.48						16.85	18.33	26.83	18.78						88.59
Cutter Water Treatment Plant	1.11	0.46	6.00	5.23	4.99												17.79
<hr/>																	
Total allocated spending	16.67	32.82	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	34.91	864.40
Percent distribution	1.93%	3.80%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	4.04%	100.00%
Overall spending	16.68	32.84	60.04	60.04	60.04	60.04	60.04	60.04	60.04	60.04	60.04	60.04	60.04	60.04	60.04	34.94	865.00
Interest during construction to January 1 of year 14	18.20	32.65	54.12	48.81	43.75	38.93	34.33	29.94	25.76	21.77	17.97	14.34	10.88	7.59	4.44	0.84	404.34

Note: The construction schedule assumes that annual appropriations will be indexed to keep in step with construction cost trends.

a lump sum (one each for the CRSP and NTUA energy rates). This overall annual OM&R cost was allocated to the participants based on their respective shares of design capacity.

The city of Gallup’s cost of purchasing 7,500 AFY of water that would be conveyed by the proposed project is included. At this point, the city of Gallup has not reached an agreement with any water supplier, so the cost estimates may change. For purposes of this analysis, the price per acre-foot of water was estimated at \$110, beginning when the city takes water in 2027. No financial cost for the water to be delivered to the Navajo and Jicarilla Apache Nation communities was included, although there may be some non-financial consideration between those two participants.

Cost of Water

In the absence of a water right settlement that establishes different terms, it is assumed that the Navajo Nation would pay for municipal and industrial water from Navajo Reservoir. These payments were estimated by Reclamation to have a present value of \$108.45 per acre-foot. The Jicarilla Apache Nation presently has rights to water they intend to use in the proposed project. It is assumed that there would be no cost for their water, as described in their Navajo Reservoir water supply contract.

The city of Gallup, however, will have to pay for obtaining water from a water right holder. The present value of a tentative purchase arrangement is \$20 million. Table I-10 shows how this cost translates to the levelized rate needed to cover the projected payments for water.

Table I-10.—Levelized water cost per thousand gallons
(2007\$)

	Navajo Nation	City of Gallup	Jicarilla Apache Nation	Project total
Present value of water costs	3,300,617	32,605,398	0	35,906,016
Annual amortization of water costs	177,317	1,751,636	0	1,928,953
Annual equivalent water deliveries (1,000 gallons)	9,889,759	2,443,890	560,120	12,893,770
Levelized cost per thousand gallons	0.02	0.72	0.00	0.15

Cost Allocation

Table I-11 summarizes the above analysis. The table addresses the capital, annual OM&R, and present value of OM&R costs for a scenario that assumes a construction budget of \$60 million per year. The table combines total construction costs, including taxes for the Reclamation-designed system and for the Gallup Regional System. Allocated costs were added for environmental mitigation, cultural resources, and land acquisition, then interest during construction was added. The present value of the annual fixed plus variable OM&R costs (discounted at 4.875 percent) was calculated and estimated under both the CRSP and NTUA energy rates. All financial costs are expressed as of the beginning of the year 2027, the year in which the proposed project would be completed. Interest during construction and interest on pre-project completion water purchase fees are compiled up to January 1, 2027, and post-completion OM&R and post-completion water purchase fees are discounted to January 1, 2027. Next, the total present value of all costs, including capital, fixed OM&R, and variable OM&R costs, is shown. Table I-11 allocates these costs to each of the participants. All costs are based on January 2007 price levels.

Figures I-6 and I-7 illustrate the components of overall cost. Figure I-6 shows how total project costs are split among capital cost, interest during construction, the present value of future OM&R costs, and the present value of water cost. Figure I-7 shows how total project costs are allocated to the three project participants. Figures I-8, I-9, and I-10 show how the cost allocated to each project participant is composed of capital, interest during construction, OM&R, and water costs. Figure I-11 shows what the levelized cost per thousand gallons would be to each project participant, assuming full self-funding.

ECONOMIC BENEFIT/COST ANALYSIS

This economic analysis section is distinct from a financial analysis because an economic analysis is concerned with the generation and use of societal resources instead of the financial analyses' focus on tracing cash receipts and expenditures. Because Reclamation is overseeing the planning of the proposed project and its participants are seeking monetary support from the Federal Government, the resources of concern are those of the United States as a whole. The principal differences between this economic analysis and a financial analysis are:

- Inclusion of non-cash project costs that would affect third parties (diminished power generation and increased salinity effects)

Table I-11.—Present value of total costs (2007)

Total capital costs by user				
	Navajo	City of Gallup	Jicarilla Apache Nation	Total
Allocated construction costs – main system	\$620,700,000	\$115,800,000	\$30,400,000	\$766,900,000
Allocated capital costs – Gallup Regional	18,600,000	29,900,000	0	48,500,000
Allocated environmental mitigation cost	4,700,000	1,100,000	200,000	6,000,000
Allocated cultural resources cost	27,100,000	6,200,000	1,300,000	34,600,000
Allocated ROW cost	7,100,000	1,600,000	300,000	9,000,000
Total project capital cost before interest	678,200,000	154,600,000	32,200,000	865,000,000
Allocated interest during construction	317,000,000	72,300,000	15,100,000	404,300,000
Total project capital cost	995,200,000	226,900,000	47,300,000	1,269,400,000
Rounded values	995,000,000	227,000,000	47,000,000	1,269,000,000
Annual OM&R costs by user (at design capacity)				
	Navajo	City of Gallup	Jicarilla Apache Nation	Total
CRSP rates				
Allocated OM&R costs – main system	\$9,542,654	\$2,075,238	\$743,636	\$12,361,528
Allocated OM&R costs – Gallup Regional	311,000	500,000	0	811,000
Annual cost of water	177,317	1,751,636	0	1,928,953
Total allocated OM&R costs	10,030,971	4,326,874	743,636	15,101,481
Rounded values	10,000,000	4,300,000	700,000	15,100,000
NTUA rates				
Allocated OM&R costs – main system	12,594,137	2,977,044	846,194	16,417,375
Allocated OM&R costs – Gallup Regional	330,000	532,000	0	862,000
Annual cost of water	171,317	1,751,636	0	1,928,953
Total allocated OM&R costs	13,101,454	5,260,681	846,194	19,208,328
Rounded values	13,100,000	5,300,000	800,000	19,200,000

Table I-11.—Present value of total costs (2007) (continued)

Present value of total OM&R costs by user				
CRSP rates	Navajo	City of Gallup	Jicarilla Apache Nation	Total
Allocated OM&R costs— main system	\$210,482,000	\$40,512,000	\$20,843,000	\$271,837,000
Allocated OM&R costs – Gallup Regional	5,781,000	9,315,000	0	15,096,000
Cost of water	3,300,617	32,605,398	0	35,906,016
Total allocated OM&R costs	219,563,617	82,432,398	20,843,000	322,839,016
Rounded values	220,000,000	82,000,000	21,000,000	323,000,000
NTUA rates				
Allocated OM&R costs – main system	267,447,000	58,117,000	23,717,000	349,281,000
Allocated OM&R costs – Gallup Regional	6,145,000	9,901,000	0	16,046,000
Cost of water	3,300,617	32,605,398	0	35,906,016
Total allocated OM&R costs	276,892,617	100,623,398	23,717,000	401,233,016
Rounded values	277,000,000	101,000,000	24,000,000	401,000,000
Present value of total capital and OM&R costs by user				
CRSP Rates	Navajo	City of Gallup	Jicarilla Apache Nation	Total
Capital	\$995,000,000	\$227,000,000	\$47,000,000	\$1,269,000,000
OM&R (including cost of water)	220,000,000	82,000,000	21,000,000	323,000,000
Total all costs	1,215,000,000	309,000,000	68,000,000	1,592,000,000
NTUA rates				
Capital	995,000,000	227,000,000	47,000,000	1,269,000,000
OM&R	277,000,000	101,000,000	24,000,000	401,000,000
Total all costs	1,272,000,000	328,000,000	71,000,000	1,670,000,000

Note: Present value of OM&R costs include fixed and variable OM&R costs incurred for partial water delivery before project completion.

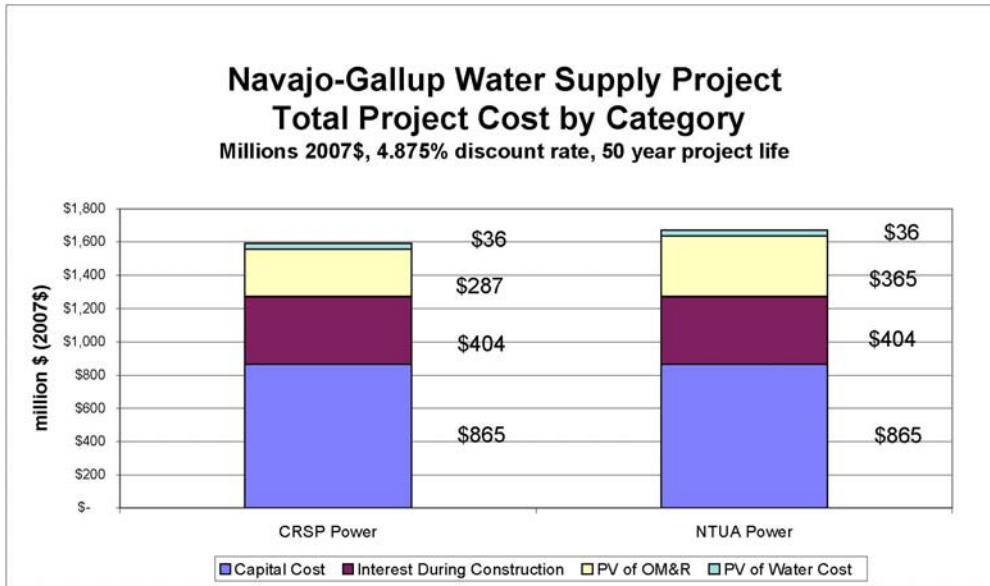


Figure I-6.—Total project cost by category.

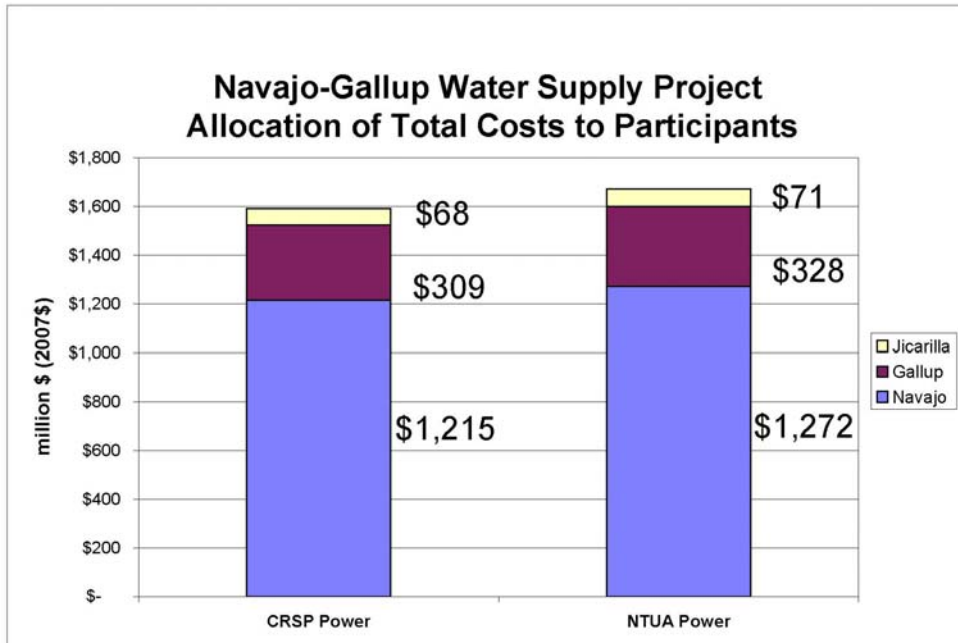


Figure I-7.—Allocation of total costs to participants.

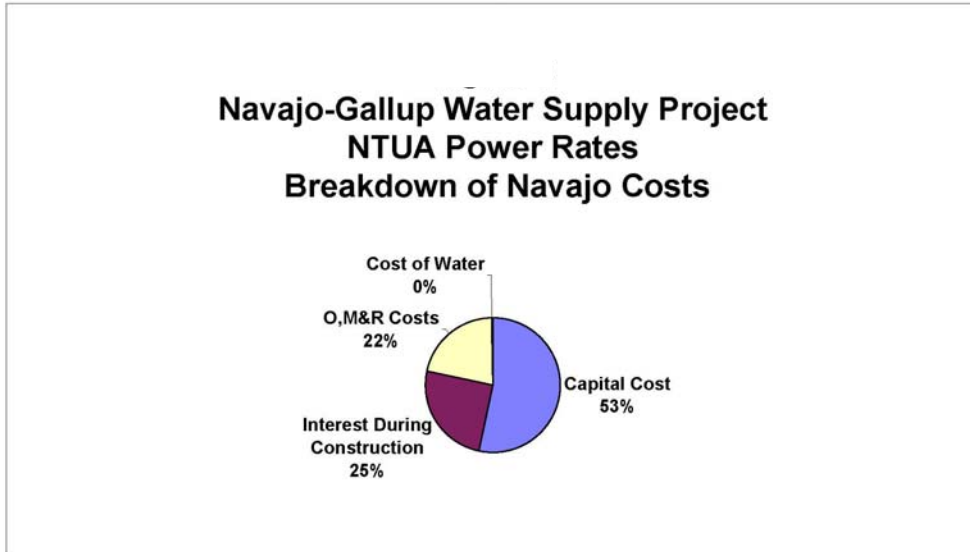


Figure I-8.—NTUA power rates (breakdown of Navajo costs).

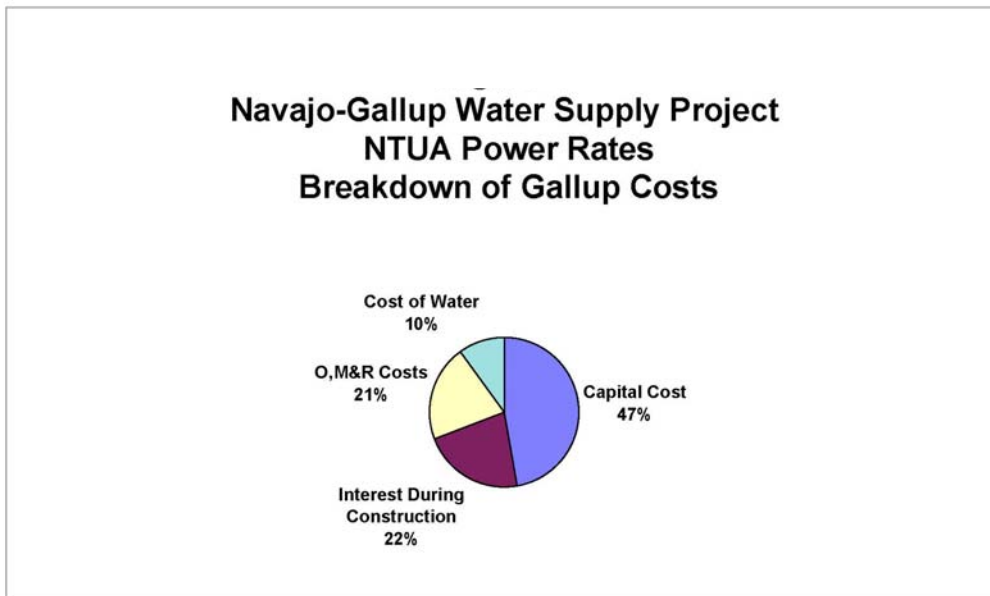


Figure I-9.—NTUA power rates (breakdown of Gallup costs).

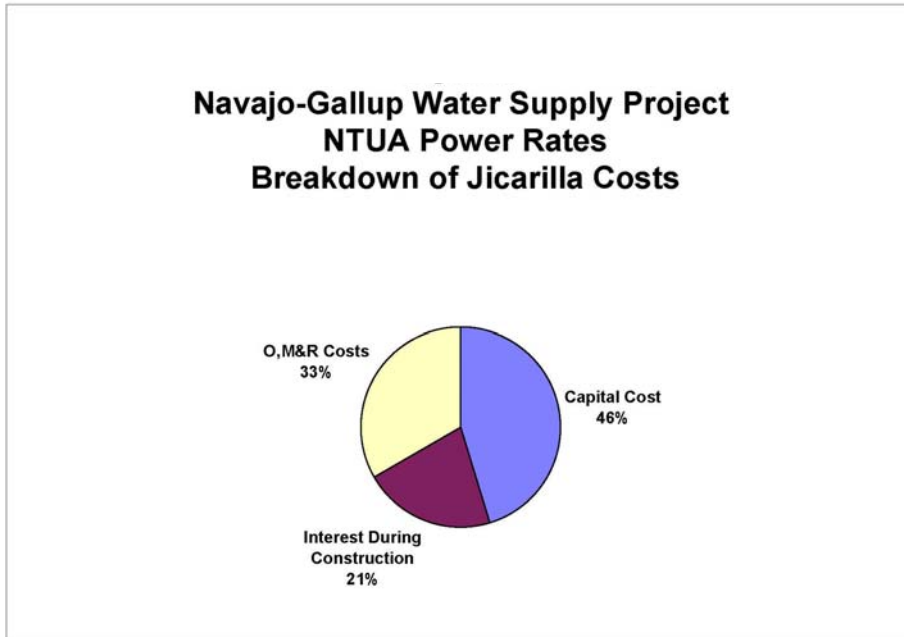


Figure I-10.—NTUA power rates (breakdown of Jicarilla costs).

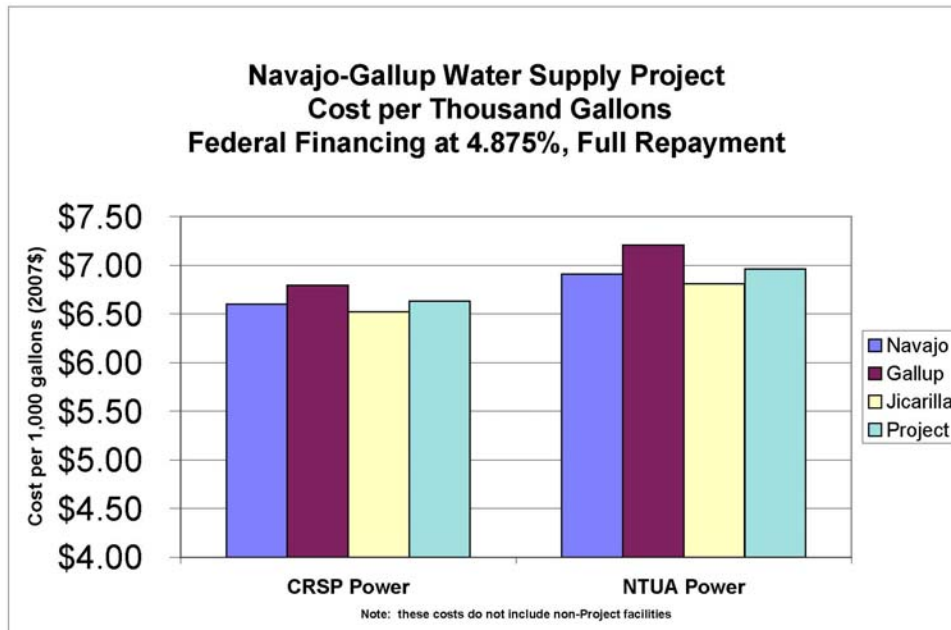


Figure I-11.—Cost per thousand gallons (Federal financing at 4.875%, full repayment).

- Exclusion of project cash costs that do not represent use of scarce national resources (use of otherwise unemployed people for construction workforce)
- Exclusion of project transfer payments that do not represent use of scarce national resources (taxes paid on construction spending)

The proposed project would principally benefit people in the northwest corner of New Mexico by providing water to which they otherwise would not have access or could only have access at a relatively higher cost. The measure of the benefits to the city of Gallup and to the Navajo Nation members who would be supplied by the proposed project is the willingness of these beneficiaries to pay for project water. The city of Gallup's willingness to pay was estimated from data on the current use of water by people in communities throughout the Mountain States. The Navajo people's willingness to pay was estimated from data on their spending for piped water service when available and on spending to haul water when no service is available.

Benefits to the Jicarilla Apache Nation were estimated from the cost of the next least expensive alternative source of water for the area of the reservation to be served by the proposed project. The Indian Health Service identifies the availability of a community water supply as critical for maintaining the health of Indian people. This report roughly estimates the indirect health benefits to Navajo people that would accrue from the provision of a clean water supply.

The completion of the water supply project would also provide infrastructure that is a necessary prerequisite to economic development and poverty relief on the reservations. While it is uncertain how much economic development would be encouraged by the proposed project, it is clear that the lack of a reliable water supply presently poses a significant constraint to most types of economic development. Table I-12 summarizes the economic costs and benefits associated with the proposed project. The details of this analysis are presented in volume II, appendix D.

Ability to Pay

Ability to pay in a water supply context refers to the affordability of a water system. A common measure of ability to pay for water services is utility payments as a percent of median household income (EPA Prioritizing Drinking Water Needs, 1999). The EPA, for example, uses 2.5 percent of median household income (MHI) to determine whether water treatment options to comply with clean water standards are affordable and should be required.

Table I-12.—Summary of project economic benefits and costs
(million 2007\$, 4.875% discount rate)

	Direct	Direct plus other
Benefits		
Gallup willingness to pay	361	361
Navajo willingness to pay	1,448	1,448
Jicarilla avoided cost	57	57
Construction employment	231	231
Indirect and induced employment	0	111
Health benefits	0	435
Reverse outmigration	0	+
Economic development	0	+
Total benefits	2,137	2,683
Costs		
Project construction	1,192	1,192
Distribution system construction	48	48
OM&R	368	368
Gallup water cost	33	33
Navajo water cost	24	24
Power generating cost	19	19
Salinity increase cost	20	20
Total costs	1,704	1,704
Benefit/cost ratio	1.25	1.57

Note: The benefit/cost ratio greater than 1.0 indicates that the anticipated project benefits are greater than cost and, thus, that the proposed project represents a beneficial use of national resources.

Legislation proposed in the 109th Congress allows the Secretary to determine the Federal share of construction costs based on an analysis of per capita income, MHI, poverty rate, ability to raise revenues, the strength of the balance sheet, and the existing cost of water, all relative to regional averages (109S 897, Section 106(f) (2)); however, the bill does not specify any threshold for these measures.

Given this lack of a basis for determining affordability, it may be useful to show the average percentage of MHI that the project participants would pay for water under various assumptions about the respective participant's share of capital cost. These percentages are determined by dividing the estimated annual household cost of project water to the MHI shown in table I-13.

Table I-13.—Median household income

	Navajo Nation	City of Gallup	Jicarilla Apache Nation
1999 median household income (1999\$)	20,005	34,868	26,750
2005 median household income (2005\$)	23,807	41,247	30,620

Source: 1999 MHI from U.S. Census Bureau, “2000 Census of Population and Housing” indexed to 2005\$ with U.S. Bureau of Labor Statistics, “Consumer Price Index,” annual growth rates from U.S. Census Bureau, “1990 Census of Housing” and “2000 Census of Population and Housing,” Dornbusch and Associates.

The affordability percentages for different levels of participant capital cost repayment are shown by adjusting the capital portion of the levelized cost. Figure I-12 shows these affordability percentages for capital repayment ratio scenarios ranging from 0 percent repayment to 100 percent. Finally, figure I-12 also compares these affordability percentages to the benchmark 2.5 percent of MHI. These benchmarks are based on EPA judgments of the affordable portion of household income used to pay for a water supply.

Figure I-12 shows that all three project participants could pay project OM&R and a portion of the capital costs without exceeding the EPA threshold of 2.5 percent.

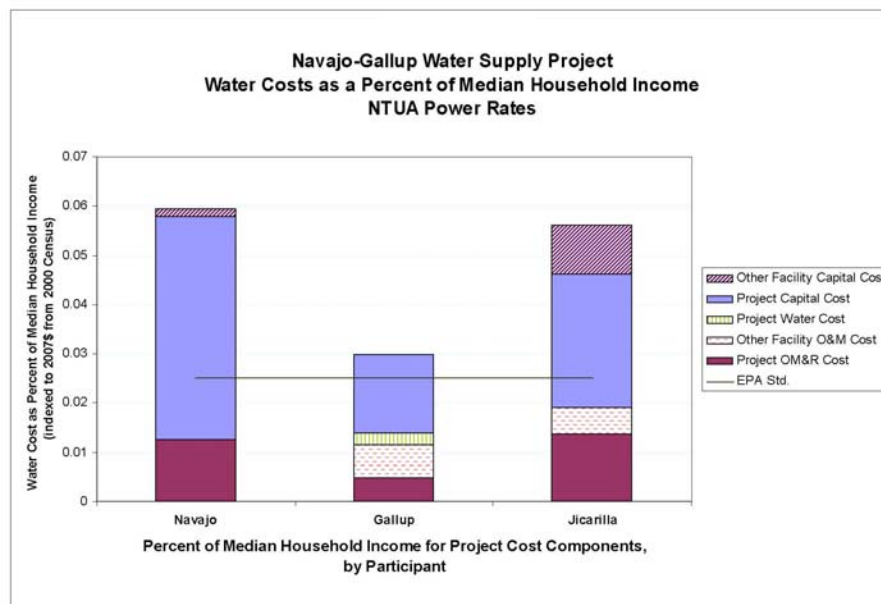


Figure I-12.—Water costs as a percent of median household income (NTUA power rates).



ATTACHMENT J

Screening Report



SCREENING REPORT

PURPOSE

This screening report summarizes the alternatives that were considered for (1) addressing the Navajo-Gallup Water Supply Project (proposed project) need, (2) screening methodology, and (3) reasons that some alternatives were eliminated. The purpose of the screening analysis was to focus subsequent analyses on alternatives that had the best chance of achieving the project goal with the fewest significant negative impacts, including cost. The goal of the proposed project (the alternatives) is to provide an adequate water supply for projected 2040 population growth and economic development in the eastern section of the Navajo Nation, city of Gallup, and the Teepee Junction area of the Jicarilla Apache Reservation.

SCREENING PROCESS

Some options were eliminated from consideration before the screening process began because, among other reasons, they would not have the ability to adequately and reliably provide the amount of quality water necessary for the projected population growth and they would be too costly. For example, under conditions affecting the Navajo Nation and the city of Gallup, most of the aquifers previously investigated were found to be unable to meet long-term municipal development because of the harmful impacts of continued over-drafting of the groundwater. It is assumed these groundwater sources would be used, where possible, in conjunction with surface water to meet the long-term water demand. On the Jicarilla Apache Reservation, previous planning efforts included investigating the possibility of diverting water from the Navajo River and pumping water to southern parts of the reservation. However, a pipeline project from these sources was found to be too costly.

For the overall project area, such nonstructural options as water conservation, water re-use, conjunctive use of groundwater, and aquifer storage were considered but eliminated. Water re-use and groundwater recharge would not provide additional water supplies. Water conservation is already maximized in the proposed project area and all of the alternatives assume water conservation will continue. In addition, the nonstructural alternatives would not supply enough water for future use. Action

alternatives for both 2020 and 2040 capacities were evaluated even though only the 2040 alternatives meet the proposed project need. This was done to help answer questions relating to decreasing the cost of the proposed project by reducing its size.

The set of alternatives that went through a formal screening process were developed in part with public input (scoping meetings), informal public contacts, coordination with other entities, and interagency consultations. A project Steering Committee has been in existence since the early 1990s to guide the proposed project's development and is composed of representatives and their technical experts from the Navajo and Jicarilla Apache Nations, city of Gallup, State of New Mexico, North West New Mexico Council of Governments, Navajo Tribal Utility Authority (NTUA), Indian Health Service, Bureau of Indian Affairs, and the Bureau of Reclamation (Reclamation). The steering committee contributed to the screening process.

The screening process began with the evaluation of eight alternatives. Six of the alternatives were structural, including the San Juan River Public Service Company of New Mexico (SJRPNM), San Juan River Infiltration, Navajo Indian Irrigation Project (NIIP) Moncisco, NIIP Coury Lateral, NIIP Cutter, and NIIP Amarillo Alternatives' configurations. The other two alternatives were the nonstructural Water Conservation Alternative and the National Environmental Policy Act (NEPA)-required No Action Alternative. The plan selection process, or screening, included two categories of screening criteria: the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Principles and Guidelines)* four tests of viability and nine factors covering the four accounts: national economic development (NED), regional economic development (RED), environmental quality (EQ), and other social effects (OSE). Within the two categories of screening criteria, there were four independent screening analyses (or steps) to arrive at the final alternative scoring and ranking.

First, all eight alternatives were initially screened using the *Principles and Guidelines'* four tests of viability (acceptability, efficiency, effectiveness, and completeness), including the six structural alternatives at the year 2040 design capacity and the smaller year 2020 design capacity. The six 2020 design capacity alternatives and the two nonstructural alternatives, Water Conservation and No Action, did not meet the four tests of viability and, as a result, were eliminated from further screening. The No Action Alternative is required by NEPA to be analyzed in the planning report/draft environmental impact statement. The result was that the six 2040 design capacity alternatives were carried forward for a more detailed comparison for screening.

The next level of screening, in part to meet the *Principles and Guidelines'* four account requirements, included a comparison of the total costs of each alternative as measured by its present worth, or cost-per-acre-foot of water value. The *Principles and Guidelines*

require Reclamation to evaluate the effects of the alternatives in the areas of the four accounts, particularly NED. The alternative chosen must maximize economic benefits. Analysis of the SJRPNM and NIIP Amarillo Alternatives showed that they had the greatest economic benefit of the six alternatives.

Nine screening factors were developed by the project Steering Committee to be used in the next two screening stages. The alternatives were screened by nine broad-ranging factors that relate to the broader *Principle and Guidelines*' four tests of viability and four accounts definitions. Another analysis screened the alternatives by only four of the environmental factors out of the nine total factors. The result was that only two alternatives scored well enough to be carried further into the impact analysis in chapter V—the SJRPNM and NIIP Amarillo Alternatives. Of those two, the SJRPNM Alternative had the best overall score. The NIIP Amarillo Alternative had very comparable present worth values to the SJRPNM Alternative and actually scored higher, assuming the use of locally available NTUA electric rates.

SCREENING CRITERIA AND PROCESS

The screening criteria included an initial screening for meeting the four tests of viability. The result was that the six action alternatives were carried forward for a more detailed screening or comparison. The next level of screening included a comparison of the total costs of each alternative as measured by its present cost-per-acre-foot value. The other screening process included screening the alternatives using the factors by assigning rating numbers, weights, scores, and then finally ranking the alternatives' results.

The Principle and Guidelines

Four Tests of Viability

The *Principles and Guidelines* describe four overarching tests of viability to be considered for each alternative. The tests assess the completeness, effectiveness, efficiency, and acceptability of the alternative plans. Alternatives that met a minimum standard under all four tests were considered viable plans and were investigated in greater detail.

Completeness – This factor measures the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective.

Effectiveness – This factor measures the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency – This factor measures the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities and is consistent with protecting the Nation’s environment.

Acceptability – This factor measures workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies.

Table IV-3 displays the results of applying the four tests of viability to the eight alternatives. The No Action and Water Conservation Alternatives did not meet the *Principles and Guidelines*’ four tests of viability; therefore, the Water Conservation Alternative was screened out and the No Action Alternative was retained solely to meet NEPA plan formulation requirements. Additionally, although the year 2020 design capacities for the six structural alternatives are not shown in table IV-3, they were found to be incomplete, ineffective, and unacceptable because they did not meet the proposed project’s objective of providing a municipal and industrial water supply for the year 2040.

The Four Accounts

The four accounts specified in the *Principles and Guidelines* are used to evaluate information on the effects of viable plans—NED, EQ, RED, and OSE accounts. Each account describes particular aspects of anticipated effects of the viable alternatives on the economy and environment.

The NED account measures changes in the economic value of the national output of goods and services, while the RED account gauges changes in the distribution of regional economic activity. The EQ account measures significant effects on natural and cultural resources, and the OSE account measures effects from perspectives that are relevant but not reflected in the other three accounts. The *Principles and Guidelines* require that the plan chosen must maximize net NED benefits as the preferred alternative, or else Reclamation must obtain an exception from the Secretary of the Interior to formulate a plan to meet other needs. The economic benefits of each alternative are essentially the same; therefore, the alternative with the smallest present worth value (also referred to as the total project cost measured in terms of cost per acre-foot of water) would represent the alternative that maximized NED benefits.

Comparison of Total Costs

The next level of screening included a comparison of the total costs (capital, construction, and operation, maintenance, and replacement [OM&R] costs) of each alternative as measured by its present worth per acre-foot. This process satisfies requirements for the NED—the most critical of the four *Principles and Guidelines*' accounts. The present worth analysis was done using the following conditions:

- (1) 50-year life of the proposed project
- (2) An interest rate of 6.37 percent
- (3) OM&R cost estimates using Colorado River Storage Project (CRSP) and NTUA power rates
- (4) Construction costs at October 2001 price levels

Results of the comparative analysis, displayed in table IV-4, show the alternatives ranked from highest to lowest cost, including their total estimated costs. Results of this comparative analysis show that the SJRPNM and NIIP Amarillo Alternatives have the lowest present worth. The SJRPNM Alternative is the lowest using CRSP power rates, and the NIIP Amarillo Alternative is the lowest using NTUA power rates. The economic benefits of all the 2040 alternatives are essentially equal for this project; therefore, the present worth is considered reflective of the NED account.

Screening Factors

Alternatives were weighted for each screening factor for comparing the alternatives in a consistent manner. The factors are defined in this section, and the weighting process is described in the next section. The nine factors identified for comparing and screening the alternatives are:

- (1) Capital cost per acre-foot of delivered water
- (2) OM&R cost per acre-foot of delivered water
- (3) Impacts to endangered species
- (4) Impacts to environmental resources (aquatic, wildlife, vegetation, land use, and recreation; endangered species are excluded)

- (5) Impacts to cultural resources
- (6) The quality of drinking water provided
- (7) Social/economic impacts
- (8) Acceptability to project beneficiaries
- (9) Risks associated with construction, implementation, and operation and maintenance

Definitions and components of the nine factors are shown in table J-1.

Alternative Ranking Process

Two screening analyses were conducted independently for the 6-year 2040 structural alternatives—a weighting of all nine evaluation factors and another conducted for only four of the nine factors, referred to as the environmental factors (endangered species, environmental resources, socioeconomics, and cultural resources). The environmental factors were evaluated independently to help identify the least environmentally impacting alternative primarily for NEPA requirements.

Within each of the two screening analyses there were four primary steps to arrive at the overall ranking of alternatives from high to low impacts that incorporated the nine factors:

- | | |
|---------------------------|--|
| <i>Step 1 (Rating)</i> | Each alternative was assigned a numerical rating (1–12) for each factor by technical experts from the Steering Committee, with 12 being the least impacting or costly based on the nine (or four environmental) factors. |
| <i>Step 2 (Weighting)</i> | Each factor was given a weight of importance by the same group. |
| <i>Step 3 (Scoring)</i> | The nine (or four environmental) factors' products of each alternative rating and each factor weight were added together to produce the alternative's overall score. |
| <i>Step 4 (Ranking)</i> | The rating of each alternative was multiplied by the weight of each of the nine (or four environmental) factors. |

Table J-1.—Definitions and components of the nine screening factors

1. Capital cost ¹	Land, relocation, and associated damage	Environmental mitigation	Protection of cultural resources
Construction			
2. OM&R	Personnel	Power	Material and equipment
3. Endangered species			
<i>Endangered aquatic resources</i> ²	Colorado pikeminnow Razorback sucker	<i>Wildlife resources</i> Southwestern willow flycatcher Bald eagle Golden eagle Ferruginous hawk nesting habitat	<i>Vegetation resources</i> Number of populations of Mesa Verde cactus disturbed or removed
4. Environmental resources	<i>Aquatic</i>	<i>Vegetation</i>	<i>Wildlife resources</i>
Native and trout fisheries	Physical size of land used for the proposed project	Upland area disturbed Upland area removed Riverine habitat disturbed Riparian shrub removed Number of bitit fleabane populations potentially disturbed Aztec gilia acres removed Number of San Juan milkweed populations disturbed and removed	Potential to remove large cottonwoods used by raptors Area required for structures for potential raptor nesting/feeding habitats Miles of transmission line
Aquatic insects			<i>Recreation</i> Tailwater fishing Flyfishing Wade-fishing Dory fishing Commercial guide and outfitting Others <i>River recreation</i> Fishing Rafting Commercial guiding and outfitting <i>Reservoir recreation</i>
Zooplankton			
Others dependent on lotic and lentic habitats			
5. Cultural resources	<i>Land use</i>		
Historic or archaeological resources and traditional cultural properties (TCPs)	Physical size of land used for the proposed project		
Culturally significant landscapes			
Prehistoric and historic archaeological sites and isolated artifacts or features			
Historic structures			
Human burials			
Sacred sites			
Areas of important cultural value to existing communities (TCPs)			

Table J-1.—Definitions and components of the nine screening factors (continued)

6. Drinking water quality⁴		
Total dissolved solids	Contamination from other sources (waste water, etc.)	Sulfates (salts)
7. Socioeconomics⁵		
<i>Construction</i> Temporary infusion of money into the local economy	<i>Drinking water availability</i> Would be a positive impact to areas that do not currently have adequate supplies Positive health and economic impacts expected	
8. Acceptability		
Cost	Political acceptability	Impacts to existing resources and infrastructure
9. Risk		
<i>Constructability</i> Standard/typical construction methods Proven technology Availability of field conditions Geologic formations Safety to the public Availability of technology High degree of unknowns such as geologic formations, permeability of river gravels, foundation conditions for a dam, rock encountered during construction, saturated conditions	<i>Reliability</i> Dependence on NIIP infrastructure Ability to deliver water without interruption Control of changing conditions over time Quantity of mechanical and electrical equipment Water quality (sediment)	

¹ The cost level for comparison was October 2001 and was broken down into cost per acre-foot so that the 2020 and 2040 alternatives could be compared.

² Measured in miles of critical habitat that would experience increased flows and the change in average minimum flows for each alternative.

³ Cultural resources are physical or other expressions of human activity and, if eligible for inclusion in the *National Register of Historic Places*, are protected under the National Historic Preservation Act of 1966, as amended in 1992, and may also be protected under the Native American Graves and Repatriation Act of 1990; the American Indian Religious Freedom Act; Executive Order 12007, Protection of Native American Sacred Sites; and other State, agency, or Tribal laws and policies.

⁴ Sedimentation was not considered because it can be handled by the treatment process.

⁵ Factors that impact the social setting or economy.

Step 1 – Alternative Rating Process

- (1) *Capital Costs Factor* – Each alternative was assigned a rating from 1–12, with the least cost per acre-foot rated 12 and the most cost per acre-foot rated 1.
- (2) *OM&R* – Same as (1).
- (3) *Endangered Species* – Aquatic, wildlife, and endangered species were considered. Effect values were assigned for each resource, and all resources were weighted equally.
- (4) *Environmental Resources* – Aquatic resources (30 percent), land use (5 percent), wildlife (20 percent), vegetation (25 percent), and recreation (20 percent) were considered (the respective weight given to each of the resources is shown in parentheses).
- (5) *Cultural Resources* – The cultural resource evaluation used the density of sites, which included archaeological, ethnographic, and in-use sites for comparison of alternatives. The alternative with the least site disturbance was given a rating of 12, and the alternative with the most disturbance was given a rating of 1.
- (6) *Drinking Water Quality* – The alternatives providing the best quality of drinking water were given a rating of 12, and the alternatives providing the worst quality of drinking water were given a rating of 1. Water from Navajo Reservoir is of better quality water than water from the San Juan River downstream of the reservoir.
- (7) *Socioeconomic* – These are factors that impact social structure or economy of the beneficiaries of the proposed project. Water delivery to the proposed project area is the same for each alternative, and the construction impacts are nearly the same with each alternative. All of the alternatives providing water to the same area and the same quantity would be rated the same. All alternatives were therefore rated the same.
- (8) *Acceptability* – This was the project Steering Committee’s concept of the preferred alternative. The components of this factor considered were political supportability, impact to existing resources and infrastructure, and compatibility with the future planned development. One rating was given to each alternative, with 12 being the most acceptable and 1 being the least acceptable.

- (9) *Risk* – Reliability and constructability were the criteria used with equal weighting. Risk included those variables or unknowns in each alternative that could prevent the complete construction or the continued operation after construction of the proposed project. The alternative with the least risk was given a 12 rating, and the alternative with the most risk was given a 1 rating.

Step 2 – Factor Weight Assignment Process

A weight or percentage of importance was assigned to each of the nine (or four environmental) factors. Importance was assigned based on the factors’ relative anticipated importance or impacts if the alternative was implemented. The combined weights totaled 100 percent. This was done for the nine factors as well as the four environmental-only factors; two independent analyses were completed for comparison purposes. The weighting for each factor is shown in table J-2.

Table J-2.—Factor weights

Criteria	Combined weight factors (percentages)	Environmental factors only (percentages)
Capital costs	20	0
OM&R	20	0
Endangered species	20	30
Environmental resources	20	30
Acceptability	2	0
Risk	10	0
Water quality	2	0
Socioeconomics	3	20
Cultural resources	3	20
Total percent	100	100

Step 3 – Scoring: Alternative Rating Multiplied by Factor Weights

This step involved multiplying the alternative ranking (1–12) by the assigned weights to get the numeric score for each alternative for that specific factor. The numeric score for each of the nine (or four) factors was added together to get the total score for each alternative, as shown in chapter IV, tables IV-5 (alternative selection criteria) and table IV-6 (alternative comparison for environmental factors).

Step 4 – Alternative Ranking

This step involved comparing the total alternative scores against each other, with the highest score being the most preferred alternative. The alternatives were rated against each other in a combined resource rank (see tables IV-5 and IV-6).

SCREENING RESULTS

To summarize the options and alternatives originally considered:

- Six structural alternatives to provide surface water supply to meet year 2020 needs were evaluated.
- Six structural alternatives to provide surface water supply to meet year 2040 needs were evaluated.
- Water conservation was considered as a stand-alone alternative.
- Alternatives using groundwater were considered.
- Other water management techniques were considered and water re-use and aquifer storage were considered in combination with the other alternatives.

Water users in the proposed project area currently have a very low consumptive use of water and will have to continue to conserve with or without a new water supply. Both water availability and water cost will force continued water conservation. Therefore, water conservation alone is not a complete alternative, but was part of all alternatives considered.

The proposed project area's groundwater resources are not adequate to provide long-term water needs and, therefore, cannot provide for a complete stand-alone alternative. The existing sustainable groundwater supply is assumed to be needed along with a surface water supply to meet future needs. Alternatives were designed assuming future use of available groundwater.

Water management techniques, like waste water re-use and aquifer storage, are not complete alternatives, but could provide better management of existing water resources. It is expected such techniques would be used by the project beneficiaries to efficiently manage their water.

The alternatives sized to meet year 2020 water demands were evaluated only for comparison of costs. As expected, the unit costs for smaller-sized alternatives were

higher in addition to not meeting the proposed project's long-term water supply purpose. In addition, these alternatives were not acceptable to the project beneficiaries. As a result, they were not carried into the screening process.

The six structural alternatives sized for the year 2040 water demands were taken through the complete screening process, and:

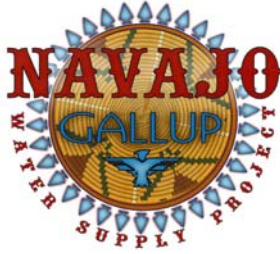
- (1) All six alternatives met the *Principles and Guidelines*' four tests of viability.
- (2) Present worth (NED) analysis showed the SJRPNM and NIIP Amarillo Alternatives were the highest ranked (least costly).
- (3) The nine screening factors revealed that the SJRPNM Alternative was the highest ranked out of the six.
- (4) Environmental factor screening (four of the total nine factors) revealed the SJRPNM Alternative, again, was the highest ranked (least impacting to the environment).

The conclusion of this analysis is that the SJRPNM Alternative ranked higher in the overall combined analysis. The NEPA analysis described in chapter V looks at the SJRPNM and NIIP Amarillo Alternatives in comparison with the No Action Alternative.



ATTACHMENT K

Vegetation



Attachment K

VEGETATION

A VEGETATION CLASSIFICATION AND LAND COVER LEGEND FOR VEGETATION RESOURCES WITHIN THE NAVAJO-GALLUP WATER SUPPLY PROJECT AREA¹

Barren – This classification includes bare soils or areas with vegetation cover less than 25 percent, typically with very light-colored soils. Dark soils may be classified as rock outcrop or a vegetation classification with cover as low as 10 percent.

Basin/Playa – This vegetation classification includes drainage basins, playas, and stock tanks. Small features may not be identified, and features lacking water or with very shallow water may be identified as barren soils. Features with substantial vegetation may be identified as wetland or lowland/swale grassland vegetation.

Great Basin Broadleaf Deciduous Desert Scrub – Shrub dominated by broadleaf deciduous shrubs that are cold and drought tolerant. The major cover types are four-wing saltbush (*Atriplex canescens*) and rubber rabbitbrush (*Chrysothamnus nauseosus*), with lesser amounts of shadscale (*Atriplex confertifolia*) and winterfat (*Ceratoides lanata*) cover types. Big sage (*Artemisia tridentata*) may be present, but is not dominant. Herbaceous cover is variable, ranging from very sparse to grassy. Characteristic species are Indian ricegrass (*Oryzopsis hymenoides*), and western wheatgrass (*Agropyron smithii*), mallow (*Sphaeralcea parvifolia*). This vegetation classification is found at elevations from 3500 to 7200 feet.

Great Basin Foothill-Piedmont Grassland – Grasslands of mountain foothills, mesa tops, and piedmont slopes. Major cover types are Galleta (*Hilaria jamesii*) and Indian ricegrass. Shrubs are common and include four-wing saltbush, greene rabbitbrush (*Chrysothamnus greenii*), and big sage. This vegetation classification is found at elevations from 4500 to 7200 feet.

¹ Developed from the report entitled “A Vegetation Classification and Land Cover Legend for Application to New Mexico Gap Analysis” produced by the New Mexico Cooperative Fish and Wildlife Resource Unit (Muldavin et al., 1996).

Great Basin Lowland/Swale Grassland – Swale and basin bottom grasslands make up this classification type. The primary component is alkali sacaton (*Sporobolus airoides*), and vegetation diversity is low. Occasionally, four-wing saltbush, big sage, and giant sacaton (*Sporobolus giganteus*) occur. This vegetation type is found from 3500 to 7200 feet in elevation and often occurs in a matrix with desert scrub and open conifer woodlands.

Great Basin Microphyllous Desert Scrub – Small-leaved, cold- and drought-tolerant shrubs dominate this vegetation classification. Big sagebrush, black sagebrush (*Artemisia nova*), and Bigelow's sagebrush (*Artemisia begelovii*) are the major species. Four-wing saltbush (*Atriplex canescens*), shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and winterfat are also common. Herbaceous cover ranges from very sparse to grassy. Common forbs include Indian ricegrass, western wheatgrass, and mallow (*Sphaeralcea* sp.). This vegetation classification is found from 5250 to 7200 feet in elevation.

Irrigated Agriculture – Cultivated fields with cash crops such as alfalfa, corn, melons, and irrigated pastures comprise this cover type. This classification may also include remnants of native riparian vegetation in river valleys or plowed fields. The Gap Analysis² vegetation data may underestimate the area covered by this habitat type because some areas have been recently converted to agriculture.

Mid-Grass Prairie – Grasslands dominated by grasses generally greater than 1.5 feet and less than 3 feet tall, but may be grazed much shorter. The major cover types are sideoats gramma (*Bouteloua curtipendula*), New Mexico needlegrass (*Stipa neomexicana*), western wheatgrass, little bluestem (*Schizachyrium scoparium*), and sand dropseed (*Sporobolus cryptandrus*). Other common subdominant grass species include vine-mesquite grass (*Panicum obtusum*), plains lovegrass (*Eragrostis intermedia*), and plains bistlegrass (*Setaria macrostachya*). Important forbs include slender scurfpea (*Psoralea tenuiflora*) and white prairie clover (*Petalostemon candidum*). This vegetation classification ranges in elevations from 4000 to 8000 feet.

Riverine/Lacustrine – Rivers, streams, and lakes are included in this cover type. Streams and rivers less than 98 feet in width will exhibit breaks or not be recognized. Very small, dry, weedy, or shallow ponds may not be mapped.

Rock Outcrop – This vegetation classification bare surfaces only if substantial bare surface is facing skyward. It also may include areas of bare soils.

² A comparison of the distribution of elements of biodiversity with that of areas managed for their long-term viability to identify elements with inadequate representation.

Rocky Mountain/Great Basin Closed Conifer Woodland – Woodlands dominated by rounded crown, low-statured conifers that form moderately closed to moderately open canopies (>60 percent) canopy cover. The major cover type is pinyon pine (*Pinus edulis*). Junipers (*Juniperus monosperma*, *J. osteosperma*, *J. scopulorum*, and *J. deppeana*) are common canopy associates. The undergrowth is variable with elements not only from the Rocky Mountains, but also the Great Basin biogeographic province. Some communities are dominated by shrubby oaks (*Quercus gambelii*, *Q. undulate*, *Q. grisea*, *Q. turbinella*) or other shrubs such as mountain mahogany (*Cercocarpus montanus*) and big sage. Other communities are distinctly grassy and, at higher elevations, are commonly dominated by cool-season grasses such as western needlegrass (*Stipa Columbiana*), Scribner needlegrass (*Stipa scribnerii*), Arizona fescue (*Festuca arizonica*), and mutton bluegrass (*Poa fendleriana*). At lower elevations, warm-season grasses such as blue grama (*Bouteloua gracilis*) or sand bluestem (*Andropogon hallii*) can predominate. Common forbs are wholeleaf paintbrush (*Castilleja integra*), skyrocket (*Ipomopsis aggregate*), trailing fleabane (*Erigeron flagellaris*) and Colorado four o'clock (*Mirabilis multiflora*). This vegetation classification ranges in elevation from 6500 to 8000 feet.

Rocky Mountain/Great Basin Open Conifer Woodland – This vegetation classification is characterized by low-growing, round-crowned conifers. Junipers are often dominant, with canopy cover from 25 to 50 percent. This habitat type also includes very open stands, often referred to as savanna, with 10 to 25 percent canopy cover. Undergrowth is primarily warm-season grasses such as purple three awn (*Aristida longiseta*), blue gramma (*Bouteloua gracilius*), and galleta. In some communities, shrubs such as snakeweed (*Gutierrezia sarothrae*), big sage, winterfat, and rabbit brush (*Chrysothamnus* sp.) are well represented. James' wild buckwheat (*Eriogonum jamesii*) and stemless woollybase (*Hymenoxys acaulis*) are common forbs. This vegetation classification is found at elevations from 4000 to 8000 feet.

Rocky Mountain Montane Deciduous Scrub – Cold-tolerant, deciduous broadleaf shrubs characterize this vegetation classification. Major species include mountain mahogany (*Cercocarpus montanus*), gambel oak (*Quercus gambelii*), and wavyleaf oak (*Q. undulate*). Other associated species include snowberry (*Synporicarpos oreophilus*), buckbrush (*Ceanothus fendleri*), rose (*Rosa* sp.), scrub liveoak (*Q. turbinella*) and scrub gray oak (*Q. grisea*). Undergrowth is variable, and common small-leaved, cold- and drought-tolerant shrubs dominate this vegetation classification. Big sagebrush, black sagebrush (*Artemisia nova*), and Bigelow's sagebrush (*A. bigelovii*) are the major species. Four-wing saltbush, shadscale, greasewood (*Sarcobatus vermiculatus*), and winterfat are also common. Herbaceous cover ranges from very sparse to grassy. Common forbs and grass species include fringed brome (*Bromus ciliatus*), sideoats grama (*Bouteloua curtipendula*), green sprangletop (*Leptochloa dubia*), and Louisiana sagewort (*Artemisia ludoviciana*). Rocky Mountain montane deciduous scrub occurs at elevations from 6000 to 9000 feet.

Rocky Mountain Lower Montane Conifer Forest – Forests dominated by rounded crown conifers that form open to closed canopies. This vegetation classification in New Mexico is represented by the ponderosa pine (*Pinus ponderosa*) cover type; other tall conifers are usually accidental. Low-stature conifers, such as pinyon pine and junipers, and broadleaf trees such as gambel oak can occur in the subcanopy. Undergrowth is highly variable depending on moisture conditions and degree of canopy closure. Common shrubs include big sage, snowberry (*Symphoricarpos oreophila*), waveleaf oak, gambel oak, and woodrose (*Rosa woodsii*). Grasses and forbs include Ross sedge (*Carex rossii*), mutton bluegrass, junegrass (*Koeleria pyramidata*), paintbrush (*Castilleja rotundifolia*), purple geranium (*Geranium caespitosum*), and meadowrue (*Thalictrum fendleri*). Under more open canopies, undergrowth tends to be more grassy and dominated by such species as screwleaf muhly (*Muhlenbergia virescens*), mountain muhly (*M. Montana*), and Arizona fescue. This vegetation classification is found at elevations from 6500 to 9000 feet.

Rocky Mountain Upper Mountain Conifer Forest – Forests dominated by conical-crowned conifers that generally form closed canopies (occasional open canopies do occur). The major cover types are Douglas fir (*Psuedotsuga menziesii*), white fir (*Abies concolor*), and blue spruce (*Picea pungens*). Undergrowth is variable, ranging from sparse and moss dominated, to shrubby and forb rich, and is luxuriant in cover. Common species include Rocky Mountain maple (*Acer glabrum*), snowberry, mountain spray (*Holodiscus dumosus*), Canada violet (*Viola Canadensis*), pale geranium (*Geranium richardsonis*), elk sedge (*Carex geyeri*), and fringed brome (*Bromus ciliatus*). Elevations range from 8000 to 10,000 feet.

Rocky Mountain Subalpine and Montane Grassland – Mid- to high-elevation grasslands dominated by species associated with the Rocky Mountain biogeographic province. These grasslands are mapped in a limited, scattered distribution among the highest mountain tops of the State. Elevations usually exceed 10,000 feet.

Rocky Mountain Subalpine Conifer Forest – Closed-canopied forests dominated by evergreen needle-leaved, conical-crowned conifers. The major cover types are Englemann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*). Douglas fir and white fir can be significant successional components in the stands. Undergrowth can range from being exceedingly sparse and low diversity (mostly moss) to luxuriant and rich in species. Common characteristic species include myrtle huckleberry (*Vaccinium myrtillus*), thimbleberry (*Rubus parviflorus*), foeny sedge (*Carex foenea*), forest fleabane (*Erigeron eximius*), Jacob's ladder (*Polemonium pulcherriumum*), osha (*Ligusticum porteri*), and twinflower (*Linnaea borealis*). Elevations for this vegetation classification range from 9500 to 12,000 feet.

Short-Grass Steppe – This vegetation classification is dominated by grasses generally less than 1.5 feet tall. Blue gramma and hairy gramma (*Bouteloua hirsute*) are the principal species. Other co-dominate grasses include purple threeawn, western wheatgrass, and galleta. Shrubs such as winterfat, prairie prickly pear (*Opuntia phaeacantha*), and yucca (*Yucca* sp.) may also be present. Common forbs include milkvetch (*Astragalus* sp.), buckwheat (*Eriogonum* sp.), curly gumweed (*Grindella squarrosa*), and prairie coneflower (*Helianthus petiolaris*). Short-grass steppe is found at elevations from 4000 to 7500 feet.

Southwestern Plains and Forested/Shrub Wetlands – Vegetation dominated by woody species primarily associated with the interior Southwest and Plains biogeographic provinces. The Southwestern and Plains Broadleaf Forest includes forests dominated by broadleaf, cold deciduous trees. Major cover types are fremont cottonwood (*Populus fremontii*), plains cottonwood (*P. sargentii*), Arizona walnut (*Juglans major*), netleaf hackberry (*Celtis reticulate*), and Arizona sycamore (*Platanus wrightii*). Southwestern and Plains Shrub Wetlands include shrublands dominated by cold deciduous shrubs. Major cover types in coyote willow (*Salix exigua*) and seepwillow (*Baccharis glutinosa*). Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix* spp.) are major exotic cover types. Elevation for this vegetation classification ranges from 3000 to 7000 feet.

Urban Vegetated – Includes areas classified as vegetative cover within the urban boundary. Most agriculture and riparian vegetation retained their original classification.

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Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Abronia fragrans</i>	fragrant sand verbena	X	X	X
<i>Aegilops cylindrica</i>	jointed goatgrass		X	X
<i>Agropyron cristatum</i>	crested wheatgrass	X	X	X
<i>Agrostis stolonifera</i>	redtop		X	X
<i>Allionia incarnata</i>	trailing four o'clock	X		
<i>Allium macropetalum</i>	largeflower onion		X	
<i>Allium</i> sp.	wild onion	X		
<i>Alopecurus aequalis</i>	shortawn foxtail		X	
<i>Alyssum minus</i>	small alyssum	X	x	
<i>Amaranthus blitoides</i>	prostrate pigweed	X	X	
<i>Amaranthus retroflexus</i>	redroot pigweed	X	X	
<i>Ambrosia acanthicarpa</i>	bur ragweed	X	X	X
<i>Ambrosia trifida</i>	giant ragweed	X		
<i>Amelanchier utahensis</i>	Utah serviceberry		X	X
<i>Andropogon gerardii</i>	big bluestem		X	X
<i>Androstephium breviflorum</i>	purple funnel-lily	X	X	
<i>Apocynum cannabinum</i>	dogbane		X	
<i>Arabis</i> sp.	rockcress	X	X	X
<i>Arctium minus</i>	burdock		X	
<i>Arenaria fendleri</i>	fendler sandwort			X
<i>Aristida purpurea</i>	purple threeawn	X	X	X
<i>Artemisia bigelovii</i>	Bigelow sagebrush	X	X	X
<i>Artemisia dracunculus</i>	terragon		X	X
<i>Artemisia filifolia</i>	sand sagebrush		X	X
<i>Artemisia frigida</i>	fringed sagebrush		X	X
<i>Artemisia ludoviciana</i>	Louisiana wormwood	X	X	X
<i>Artemisia nova</i>	black sagebrush		X	X
<i>Artemisia spinescens</i>	budsage	X	X	
<i>Artemisia tridentata</i>	big sagebrush	X		X
<i>Asclepias speciosa</i>	showy milkweed	X	X	X
<i>Asclepias involucrata</i>	dwarf wilkweed			X
<i>Asclepias sanjuanensis</i>	San Juan milkweed	X	X	
<i>Asclepias subverticillata</i>	whorled milkweed	X	X	X
<i>Asparagus officinalis</i>	asparagus	X		
<i>Aster falcatus</i>	prairie aster	X		
<i>Aster occidentalis</i>	western aster	X		
<i>Astragalus amphioxys</i>	crescent milkvetch	X	X	X
<i>Astragalus calycosus</i>	torrey milkvetch	X	X	
<i>Astragalus ceramicus</i>	painted milkvetch	X	X	X
<i>Astragalus emoryanus</i>	emory milkvetch		X	
<i>Astragalus flavus</i>	yellow milkvetch		X	X
<i>Astragalus fucatus</i>	Hopi milkvetch	X	X	
<i>Astragalus kentrophyta</i>	spiny milkvetch		X	X
<i>Astragalus lentiginosus</i>	freckled milkvetch		X	X
<i>Astragalus lonchocarpus</i>	great rushy milkvetch	X		X
<i>Astragalus mollissimus</i>	wooly locoweed	X	X	X

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Astragalus newberryi</i>	newberry milkvetch		X	
<i>Astragalus nuttallianus</i>	small-flowered milkvetch	X	X	X
<i>Astragalus praelongus</i>	stinking milkvetch		X	
<i>Astragalus proximus</i>	Aztec milkvetch			X
<i>Astragalus sabulonum</i>	gravel milkvetch	X	X	
<i>Atriplex canescens</i>	four-wing saltbush	X	X	X
<i>Atriplex confertifolia</i>	shadscale	X	X	X
<i>Atriplex corrugata</i>	mat-saltbush	X	X	
<i>Atriplex powellii</i>	Powell orach	X	X	
<i>Atriplex saccaria</i>	stalked orach	X	X	X
<i>Atriplex gardneri</i>	castle valley saltbush	X	X	
<i>Atriplex obovata</i>	New Mexico saltbush	X	X	
<i>Avena fatua</i>	oats	X	X	
<i>Bahia dissecta</i>	cutleaf		X	
<i>Bassia hyssopifolia</i>	five-hook bassia	X	X	X
<i>Bouteloua barbata</i>	sixweeks grama	X	X	X
<i>Bouteloua curtipendula</i>	sideoats grama		X	
<i>Bouteloua eriopoda</i>	black grama		X	
<i>Bouteloua gracilis</i>	blue grama	X	X	X
<i>Brickellia longifolia</i>	longleaf brickellbush	X		X
<i>Brickellia microphylla</i>	rough brickellbush			X
<i>Brickellia oblongifolia</i>	mohave brickellbush			X
<i>Bromus anomalus</i>	nodding brome	X		X
<i>Bromus inermis</i>	smooth brome	X	X	
<i>Bromus japonicus</i>	Japanese brome	X	X	X
<i>Bromus tectorum</i>	cheatgrass	X	X	X
<i>Calochortus flexuosus</i>	stragglng mariposa		X	
<i>Calochortus nuttallii</i>	sego lily		X	
<i>Camissonia scapoidea</i>	Paiute suncup		X	
<i>Capsella bursa-pastoris</i>	shepherds purse	X		
<i>Cardaria draba</i>	whitetop		X	
<i>Carduus nutans</i>	musk thistle	X	X	
<i>Carex sp.</i>	sedge	X		X
<i>Castilleja chromosa</i>	common paintbrush	X	X	X
<i>Castilleja integra</i>	wholeleaf paintbrush			X
<i>Castilleja linariifolia</i>	narrowleaf paintbrush	X	X	X
<i>Cenchrus longispinus</i>	field sandbur	X	X	
<i>Centaurea repens</i>	russian knapweed	X	X	X
<i>Ceratoides lanata</i>	winterfat	X	X	X
<i>Cercocarpus montanus</i>	mountain mahogany			X
<i>Chaenactis stevioides</i>	stevia dusty-maiden	X	X	X
<i>Chamaesaracha coronopus</i>	green false nightshade		X	X
<i>Chenopodium fremontii</i>	fremont goosefoot		X	X
<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot	X	X	X

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Chloris virgata</i>	feather fingergrass	X	X	
<i>Chorispora tenella</i>	musk-mustard	X	X	X
<i>Chrysothamnus Greenei</i>	Greene rabbitbrush	X	X	X
<i>Chrysothamnus linifolius</i>	spreading rabbitbrush	X		X
<i>Chrysothamnus nauseosus</i>	rubber rabbitbrush	X	X	X
<i>Chrysothamnus viscidiflorus</i>	viscid rabbitbrush		X	X
<i>Cichorium intybus</i>	chickory	X	X	
<i>Cirsium arvense</i>	Canada thistle	X		
<i>Cirsium undulatum</i>	gray thistle			X
<i>Clematis ligusticifolia</i>	white virgins-bower		X	
<i>Cleome serrulata</i>	Rocky Mountain beeplant		X	X
<i>Cleomella palmeriana</i>	Rocky Mountain stickweed		X	
<i>Collinsia parviflora</i>	blue-eyed mary	X		X
<i>Comandra umbellata</i>	bastard toadflax		X	X
<i>Convolvulus arvensis</i>	bindweed	X		X
<i>Conyza canadensis</i>	horseweed	X	X	X
<i>Cordylanthus wrightii</i>	wright birdsbeak			X
<i>Coryphantha vivipara</i>	purple ballcactus	X	X	
<i>Coryphantha vivipara</i>	ball cactus			X
<i>Cowania mexicana</i>	cliffrose		X	X
<i>Crepis occidentalis</i>	western hawksbeard			X
<i>Cryptantha cinerea</i>	James cryptanth	X	X	X
<i>Cryptantha confertifolia</i>	golden cryptanth			X
<i>Cryptantha crassisepala</i>	plains cryptanth	X	X	X
<i>Cryptantha flava</i>	yellow cryptanth			X
<i>Cryptantha flavoculata</i>	yellow-eye cryptanth			X
<i>Cryptantha fulvocanescens</i>	yellow-hair cryptanth			X
<i>Cryptantha gracilis</i>	slender cryptanth			X
<i>Cuscuta sp.</i>	dodder		X	
<i>Cymopterus acaulis</i>	plains spring-parsley	X		
<i>Cymopterus bulbosus</i>	onion spring-parsley		X	
<i>Cymopterus purpurascens</i>	widewing spring-parsley	X		
<i>Cynodon dactylon</i>	bermuda grass	X	X	
<i>Dactylis glomerata</i>	orchard grass	X	X	
<i>Dalea lanata</i>	wooly dalea		X	
<i>Dalea oligophylla</i>	western prairie-clover		X	X
<i>Delphinium andersonii</i>	anderson larkspur	X	X	X
<i>Descurainia pinnata</i>	pinate tansy-mustard	X	X	
<i>Descurainia sophia</i>	flixweed tansy-mustard	X	X	X
<i>Dicora brandegei</i>	brandege sandplant		X	
<i>Distichlis spicata</i>	desert saltgrass	X	X	
<i>Dithyrea wislizenii</i>	spectacle pod	X	X	X
<i>Draba cuneifolia</i>	wedgeeaf	X		X
<i>Dracocephalum parviflorum</i>	common dragonhead	X	X	

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Dyssodia papposa</i>	pappose glandweed	X	X	X
<i>Echinocereus fendleri</i>	fendler strawberry cactus		X	
<i>Echinocereus triglochidiatus</i>	hedgehog cactus		X	X
<i>Echinochola crus-galli</i>	barnyard grass	X		
<i>Elaeagnus angustifolia</i>	Russian olive	X	X	X
<i>Eleocharis palustris</i>	creeping spikerush	X		X
<i>Elymus canadensis</i>	Canada wildrye	X	X	X
<i>Elymus elongatus</i>	tall wheatgrass	X	X	
<i>Elymus repens</i>	quackgrass	X	X	
<i>Elymus smithii</i>	western wheatgrass	X	X	X
<i>Elymus trachycaulus</i>	slender wheatgrass	X	X	X
<i>Ephedra cutleri</i>	cutler joint-fir		X	X
<i>Ephedra torreyana</i>	torrey joint-fir	X	X	X
<i>Ephedra viridis</i>	Mormon tea	X	X	X
<i>Equisetum arvense</i>	meadow horsetail	X		
<i>Equisetum hyemale</i>	common scouringrush	X		
<i>Eremopyrum triticeum</i>	annual wheatgrass	X	X	X
<i>Eriastrum diffusum</i>	spreading eriastrum	X	X	X
<i>Erigeron bellidiastrum</i>	pretty daisy		X	
<i>Erigeron divergens</i>	spreading daisy	X	X	X
<i>Erigeron flagellaris</i>	trailing daisy			X
<i>Erigeron pulcherrimus</i>	basin daisy			X
<i>Eriogonum alatum</i>	winged buckwheat		X	X
<i>Eriogonum cernuum</i>	nodding buckwheat		X	X
<i>Eriogonum corymbosum</i>	corymb buckwheat		X	X
<i>Eriogonum divaricatum</i>	spreading buckwheat	X	X	X
<i>Eriogonum gordonii</i>	gordon buckwheat	X	X	
<i>Eriogonum jamesii</i>	james buckwheat		X	X
<i>Eriogonum leptocladon</i>	sand buckwheat		X	X
<i>Eriogonum leptophyllum</i>	slenderleaf buckwheat	X	X	X
<i>Eriogonum microthecum</i>	slender buckwheat	X	X	
<i>Eriogonum salsuginosum</i>	smooth buckwheat	X	X	
<i>Eriogonum shockleyi</i>	shockley buckwheat	X		
<i>Eriogonum umbellatum</i>	sulfur buckwheat			X
<i>Eriogonum wetherillii</i>	wetherill buckwheat		X	
<i>Erioneuron pulchellum</i>	fluffgrass	X	X	
<i>Erodium cicutarium</i>	storksbill	X	X	X
<i>Erysimum asperum</i>	pretty wallflower			X
<i>Erysimum capitatum</i>	western wallflower			X
<i>Euphorbia fendleri</i>	fendler spurge	X	X	X
<i>Euphorbia glyptosperma</i>	ridgeseeded spurge		X	
<i>Euphorbia parryi</i>	parry spurge	X	X	X
<i>Evolvulus nuttallianus</i>	nuttall evolvulus	X		X
<i>Festuca octoflora</i>	sixweeks fescue	X	X	X

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Forestiera pubescens</i>	New Mexico desert olive	X	X	
<i>Frankenia jamesii</i>	james frankenia	X	X	
<i>Fraxinus anomala</i>	singleleaf ash		X	
<i>Fraxinus cuspidata</i>	flowering ash		X	
<i>Gaillardia pinnatifida</i>	Hopi blanketflower	X	X	X
<i>Gaillardia pulchella</i>	blanketflower		X	
<i>Gaura coccinea</i>	scarlet gaura		X	
<i>Gaura parviflora</i>	willow gaura	X	X	
<i>Gilia aggregata</i>	scarlet gilia			X
<i>Gilia formosa</i>	Aztec glia			X
<i>Gilia gunnisonii</i>	gunnison gilia		X	
<i>Gilia haydenii</i>	hayden gilia		X	X
<i>Gilia leptomeria</i>	slender gilia	X		X
<i>Gilia multiflora</i>	blue starflower			X
<i>Glycyrrhiza lepidota</i>	licorice	X	X	
<i>Grindelia squarosa</i>	curly gumweed	X	X	
<i>Gutierrezia sarothrae</i>	broom snakeweed	X	X	X
<i>Halogeton glomeratus</i>	halogeton	X	X	X
<i>Haplopappus armerioides</i>	thrifty goldenweed			X
<i>Haplopappus drummondii</i>	drummond goldenweed		X	X
<i>Haplopappus spinulosus</i>	spiny goldenweed		X	X
<i>Helianthus annuus</i>	common sunflower	X	X	
<i>Helianthus petiolaris</i>	prairie sunflower	X	X	X
<i>Heterotheca villosa</i>	hairy goldenaster	X	X	X
<i>Hilaria jamesii</i>	galleta	X	X	X
<i>Hilaria rigida</i>	big galleta		X	
<i>Hordeum jubatum</i>	foxtail barley	X	X	X
<i>Hordeum murinum</i>	rabbit barley		X	
<i>Hordeum pusillum</i>	little barley	X	X	X
<i>Hymenopappus filifolius</i>	hyalineherb	X	X	X
<i>Hymenoxys acaulis</i>	stemless woolybase	X	X	X
<i>Hyoscyamus niger</i>	henbane		X	
<i>Ipomopsis longiflora</i>	whiteflower false gilia			X
<i>Iva axillaris</i>	poverty weed		X	
<i>Juncus balticus</i>	wire rush	X		X
<i>Juncus ensifolius</i>	swordleaf rush	X		
<i>Juncus sp.</i>	rush		X	
<i>Juniperus osteosperma</i>	Utah juniper	X		X
<i>Kochia scoparia</i>	summer-cypress	X	X	X
<i>Lactuca serriola</i>	prickly lettuce	X	X	
<i>Lappula occidentalis</i>	western stickseed	X	X	X
<i>Lathyrus sp.</i>	sweetpea		X	
<i>Lepidium montanum</i>	pepperweed		X	
<i>Lepidium perfoliatum</i>	peppergrass			X

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Leptodactylon pungens</i>	granite prickly gilia	X		X
<i>Lesquerella fendleri</i>	fendler bladderpod			X
<i>Lesquerella</i> sp.	bladderpod	X		
<i>Leucelene ericoides</i>	rose-heath	X	X	X
<i>Linum perenne</i>	blue flax		X	
<i>Linum puberulum</i>	plains flax	X	X	X
<i>Lithospermum incisum</i>	showy stoneseed		X	X
<i>Lupinus pusillus</i>	dwarf lupine	X	X	X
<i>Lycium pallidum</i>	pale wolfberry	X	X	X
<i>Lygodesmia grandiflora</i>	showy rushpink	X	X	X
<i>Machaeranthera canescens</i>	hoary aster	X	X	X
<i>Machaeranthera grindelioides</i>	gumweed aster		X	X
<i>Machaeranthera tanacetifolia</i>	tansyleaf aster	X	X	
<i>Malcomia africana</i>	African mustard		X	
<i>Malacothrix sonchoides</i>	sow-thistle desert dandelion		X	
<i>Malva neglecta</i>	common mallow	X	X	
<i>Marrubium vulgare</i>	common horehound	X	X	X
<i>Medicago lupulina</i>	black medick	X	X	X
<i>Medicago sativa</i>	alfalfa	X	X	
<i>Melilotus albus</i>	white sweetclover	X	X	
<i>Melilotus officinalis</i>	yellow sweetclover	X	X	X
<i>Mentzelia albicaulis</i>	stickleaf	X	X	X
<i>Mentzelia pumila</i>	dwarf stickleaf	X	X	X
<i>Microsteris gracilis</i>	slender false phlox	X		X
<i>Mirabilis linearis</i>	narrowleaf umbrellawort	X	X	X
<i>Mirabilis multiflora</i>	Colorado four o'clock		X	X
<i>Monolepis nuttalliana</i>	povertyweed		X	X
<i>Muhlenbergia pungens</i>	sandhill muhly	X	X	X
<i>Muhlenberia asperifolia</i>	scratchgrass muhly	X	X	X
<i>Munroa squarrosa</i>	alse buffalograss	X	X	X
<i>Nama hispidum</i>	bristly nama		X	X
<i>Oenothera caespitosa</i>	morning lily	X	X	X
<i>Oenothera pallida</i>	pale evening primrose	X	X	
<i>Oenothera albicaulis</i>	whitestem evening primrose		X	X
<i>Opuntia phaeacantha</i>	engelmann prickly pear		X	X
<i>Opuntia polycantha</i>	pricklypear cactus	X	X	X
<i>Opuntia whipplei</i>	whipple chola cactus	X	X	X
<i>Orobancha fasciculata</i>	cluster cancerroot	X	X	
<i>Orobancha ludoviciana</i>	broomrape			X
<i>Oryzopsis hymenoides</i>	indian ricegrass	X	X	X
<i>Oxytropis lambertii</i>	lambert locoweed	X		X
<i>Penstemon angustifolius</i>	narrowleaf penstemon	X	X	X
<i>Penstemon breviculus</i>	narrow mouth penstemon			X
<i>Penstemon eatonii</i>	eaton penstemon		X	

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Petalostemon purpureum</i>	prairie-clover		X	
<i>Petradoria pumila</i>	rock goldenrod			X
<i>Phacelia crenulata</i>	torrey scorpionweed	X	X	X
<i>Phacelia integrifolia</i>	crenateleaf scorpionweed	X	X	X
<i>Phleum pratense</i>	timothy	X	X	X
<i>Phlox hoodii</i>	carpet phlox			X
<i>Phlox longifolia</i>	longleaf phlox	X		X
<i>Phoradendron juniperinum</i>	juniper mistletoe			X
<i>Phragmites australis</i>	common reed	X	X	X
<i>Physalis sp.</i>	ground cherry	X	X	
<i>Physaria newberryi</i>	newberry twinpod		X	X
<i>Pinus edulis</i>	pinyon			X
<i>Plantago lanceolata</i>	buckhorn plantain	X	X	X
<i>Plantago major</i>	broadleaf plantain	X	X	X
<i>Plantago patagonica</i>	wooly plantain	X	X	X
<i>Platyschkuhria integrifolia</i>	oblongleaf bahia	X	X	X
<i>Poa annua</i>	annual bluegrass		X	X
<i>Poa fendleriana</i>	muttongrass			X
<i>Poa palustris</i>	fowl bluegrass	X		
<i>Poa pratensis</i>	Kentucky bluegrass	X		
<i>Poliomintha incana</i>	purple sage		X	
<i>Polygonum aviculare</i>	knotweed	X	X	X
<i>Polypogon monspeliensis</i>	rabbitfoot grass	X	X	X
<i>Populus acuminata</i>	lanceleaf cottonwood	X		
<i>Populus fremontii</i>	fremont cottonwood	X	X	X
<i>Portulaca oleracea</i>	purslane	X	X	X
<i>Psoralidium lanceolatum</i>	dune scurfpea	X		X
<i>Puccinellia distans</i>	weeping alkaligrass		X	X
<i>Puccinellia nuttalliana</i>	nuttall alkaligrass		X	X
<i>Purshia tridentata</i>	antelope bitterbrush		X	X
<i>Quercus gambelii</i>	gambel oak		X	X
<i>Ranunculus cymbalaria</i>	marsh buttercup	X	X	
<i>Ranunculus testiculatus</i>	bur buttercup	X		X
<i>Ratibida columnifera</i>	prairie coneflower	X	X	
<i>Rhus aromatica</i>	skunkbush sumac	X	X	
<i>Rumex crispus</i>	curled dock	X	X	X
<i>Rumex hymenosepalus</i>	canaigre dock		X	X
<i>Salix exigua</i>	coyote willow	X	X	X
<i>Salix sp.</i>	willow	X		
<i>Salsola iberica</i>	tumbleweed	X	X	X
<i>Sarcobatus vermiculatus</i>	greasewood	X	X	X
<i>Schoenrambe linifolia</i>	flaxleaf plains mustard			X
<i>Scirpus pungens</i>	common threesquare	X		X
<i>Sclerocactus cloveriae</i>	clover fishhook cactus			X

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Sclerocactus mesa-verde</i>	Mesa Verde cactus		X	
<i>Sclerocactus parviflorus</i>	devil's claw	X	X	
<i>Senecio douglasii</i>	Douglas groundsel	X	X	X
<i>Senecio multilobatus</i>	Uinta groundsel	X		X
<i>Senecio spartioides</i>	broom groundsel	X	X	X
<i>Setaria glauca</i>	yellow bristlegrass	X		
<i>Setaria verticillata</i>	bur bristlegrass		X	
<i>Sisymbrium altissimum</i>	tumbling mustard	X	X	X
<i>Sitanion hystrix</i>	squirreltail grass	X	X	X
<i>Solanum elaeagnifolium</i>	silverleaf nightshade		X	
<i>Solanum rostratum</i>	buffalobur	X	X	
<i>Solanum triflorum</i>	cutleaf nightshade	X	X	
<i>Solidago canadensis</i>	goldenrod	X		
<i>Sonchus oleraceus</i>	common sow-thistle	X		X
<i>Sophora stenophylla</i>	silvery sophora		X	
<i>Sorghum halepense</i>	johnson grass		X	
<i>Sphaeralcea coccinea</i>	common globemallow	X	X	X
<i>Sphaeralcea fendleri</i>	fendlers globemallow			X
<i>Sphaeralcea parviflora</i>	nelson globemallow	X	X	
<i>Sporobolus airoides</i>	alkali saccaton	X	X	X
<i>Sporobolus contractus</i>	spike dropseed	X	X	X
<i>Sporobolus cryptandrus</i>	sand dropseed	X	X	X
<i>Sporobolus flexuosus</i>	mesa dropseed	X		
<i>Sporobolus giganteus</i>	giant dropseed	X	X	X
<i>Stanleya pinnata</i>	prince's plume		X	X
<i>Stephanomeria exigua</i>	annual wirelettuce	X		X
<i>Stipa comata</i>	needle and thread grass	X	X	X
<i>Stipa neomexicana</i>	New Mexico feathergrass		X	X
<i>Streptanthella longirostris</i>	blackpod nippletwist			X
<i>Streptanthus cordatus</i>	heartleaf twistflower			X
<i>Suaeda torreyana</i>	torrey seepweed	X	X	X
<i>Swertia utahensis</i>	Utah swertia			X
<i>Tamarix ramosissima</i>	saltcedar	X	X	X
<i>Taraxacum officinale</i>	common dandelion	X	X	X
<i>Tetradymia canescens</i>	gray horsebrush		X	X
<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	X	X	X
<i>Thelypodopsis aurea</i>	durango tumblemustard		X	X
<i>Townsendia annua</i>	annual townsendia		X	X
<i>Townsendia incana</i>	hoary townsendia	X	X	X
<i>Tragia ramosa</i>	noseburn		X	
<i>Tragopogon dubius</i>	yellow salsify	X	X	X
<i>Tragopogon pratensis</i>	goatsbeard		X	
<i>Tribulus terrestris</i>	puncture vine	X		
<i>Triglochin maritima</i>	maritime arrowgrass			X

Scientific Name	Common Name	Farmington to Shiprock	Hogback to Gallup	Cutter Dam to Starlake
<i>Tripterocalyx carneus</i>	wooton sand verbena	X	X	
<i>Typha latifolia</i>	broad-leaved cattail	X		X
<i>Ulmus pumila</i>	Chinese elm	X	X	
<i>Verbascum thapsus</i>	wooly mullein	X		
<i>Verbena bipinnatifida</i>	Dakota vervain			X
<i>Verbena bracteata</i>	prostrate vervain	X		X
<i>Wyethia scabra</i>	rough mulesears		X	
<i>Xanthium strumarium</i>	cocklebur	X	X	X
<i>Yucca angustissima</i>	narrow-leaved yucca	X		X
<i>Yucca bacata</i>	broadleaf yucca			X
<i>Yucca harimaniae</i>	Harriman yucca	X		X



ATTACHMENT L

List of Wildlife Found in the Project Area
and Habitat Associations

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Accipiter cooperii</i>	Cooper's hawk	x		x	x
<i>Accipiter gentilis</i>	goshawk			x	x
<i>Accipiter striatus</i>	sharp shinned hawk	x	x	x	x
<i>Aquila chrysaetos</i>	golden eagle		x	x	
<i>Buteo jamaicensis</i>	red-tailed hawk		x	x	x
<i>Buteo lagopus</i>	rough-legged hawk		x		
<i>Buteo regalis</i>	ferruginous hawk		x	x	
<i>Buteo swainsoni</i>	Swainson's hawk	x	x		
<i>Cathartes aura</i>	turkey vulture		x	x	x
<i>Circus cyaneus</i>	marsh hawk		x	x	
<i>Falco columbarius</i>	merlin			x	
<i>Falco mexicanus</i>	prairie falcon			x	
<i>Falco peregrinus</i>	peregrine falcon	x	x	x	
<i>Falco sparverius</i>	American kestrel	x	x	x	x
<i>Haliaeetus leucocephalus</i>	bald eagle		x		
<i>Pandion haliaeetus</i>	osprey		x		
<i>Alectoris graeca</i>	chukar		x		
<i>Callipepla squamata</i>	scaled quail		x	x	
<i>Dendragapus obscurus</i>	blue grouse				x
<i>Lophortyx gambelii</i>	Gambel's quail	x	x	x	
<i>Phasianus colchicus</i>	ring-necked pheasant	x	x		
<i>Meleagris gallopavo</i>	turkey		x		
<i>Actitis macularia</i>	spotted sandpiper				x
<i>Actitis macularia</i>	spotted sandpiper	x			
<i>Bartramia longicauda</i>	upland plover		x		
<i>Capella galinego</i>	common snipe		x		
<i>Catoptrophorus semipalmatus</i>	willet		x		
<i>Charadrius alexandrius</i>	snowy plover		x		
<i>Charadrius semipalmatus</i>	semipalmated plover	x			
<i>Charadrius vociferous</i>	killdeer		x		
<i>Chidonias niger</i>	black tern		x		
<i>Crocethia alba</i>	sanderling		x		
<i>Ereunetes mauri</i>	western sandpiper	x			
<i>Erolia bairdii</i>	Baird's sandpiper	x			
<i>Erolia melanotos</i>	pectoral sandpiper		x		
<i>Erolia minutilla</i>	least sandpiper		x		
<i>Eupoda montana</i>	mountain plover	x	x		
<i>Himantopus mexicana</i>	black-necked stilt	x			
<i>Larus argentatus</i>	herring gull		x		
<i>Larus atricilla</i>	laughing gull		x		
<i>Larus californicus</i>	California gull		x		
<i>Larus delawarensis</i>	ring-billed gull	x			
<i>Larus philadelphia</i>	Bonaparte's gull	x			
<i>Larus pipixcan</i>	Franklin's gull		x		
<i>Limnodromus scolopaceus</i>	long-billed dowitcher	x			

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Limosa fedoa</i>	marbled godwit	x			
<i>Lopipes lobatus</i>	northern phalarope	x			
<i>Numenius americanus</i>	long-billed curlew	x			
<i>Recurvirostra americana</i>	American avocet	x			
<i>Squatarola squatarola</i>	black-bellied plover	x	x		
<i>Steganopes tricolor</i>	Wilson's phalarope	x			
<i>Sterna caspia</i>	Caspian tern		x		
<i>Sterna forsteri</i>	Forster's tern		x		
<i>Sterna hirundo</i>	common tern		x		
<i>Totanus flavipes</i>	lesser yellowlegs	x			
<i>Totanus melanoleucus</i>	greater yellowlegs	x			
<i>Tringa solitaria</i>	solitary sandpiper	x			
<i>Xema sabini</i>	Sabine's gull		x		
<i>Coccyzus americanus</i>	yellow-billed cuckoo	x			
<i>Columba fasciata</i>	band-tailed pigeon	x		x	x
<i>Columba livia</i>	rock dove		x	x	
<i>Geococcyx californianus</i>	road runner		x	x	x
<i>Scardafella inca</i>	Inca dove		x		
<i>Zenaidura macroura</i>	mourning dove	x	x	x	
<i>Aegolius acadicus</i>	saw-whet owl				x
<i>Asio flammeus</i>	short-eared owl		x		
<i>Asio otus</i>	long-eared owl	x		x	
<i>Athene cunicularia</i>	burrowing owl		x		
<i>Bubo virginianus</i>	great-horned owl	x			
<i>Glaucidium gnoma</i>	pygmy owl			x	x
<i>Otus asio</i>	screech owl	x		x	x
<i>Otus flammeolus</i>	flamulated owl				x
<i>Strix occidentalis</i>	spotted owl			x	x
<i>Tyto alba</i>	barn owl		x	x	
<i>Chordeiles minor</i>	common nighthawk	x	x	x	x
<i>Phalaenoptilus nuttallii</i>	poorwill		x	x	x
<i>Aeronautes saxatalis</i>	white-throated swift	x		x	x
<i>Archilochus alexandri</i>	black-chinned hummingbird	x		x	
<i>Cypseloides niger</i>	black swift		x		
<i>Selasphorus platycercus</i>	broad-tailed hummingbird	x		x	x
<i>Selasphorus rufus</i>	rufous hummingbird	x	x	x	x
<i>Stellula calliope</i>	calliope hummingbird				x
<i>Megaceryle alcyon</i>	belted kingfisher	x			
<i>Colaptes auratus</i>	common flicker	x			x
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	x			
<i>Melanerpes formicivorus</i>	acorn woodpecker				x
<i>Melanerpes lewis</i>	Lewis woodpecker	x		x	x
<i>Picoides pubescens</i>	downy woodpecker	x		x	x
<i>Picoides tridactylus</i>	northern 3-toed woodpecker				x

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Picoides villosus</i>	hairy woodpecker	x		x	x
<i>Sphyrapicus thyroideus</i>	Williamson's sapsucker			x	x
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	x		x	x
<i>Agelaius phoeniceus</i>	red-winged blackbird	x		x	x
<i>Aimophila cassinii</i>	Cassin's sparrow		x		
<i>Amphispiza belli</i>	sage sparrow		x		
<i>Amphispiza bilineata</i>	black-throated sparrow		x		
<i>Anthus spinoletta</i>	water pipit	x		x	x
<i>Aphelocoma coerulescens</i>	scrub jay			x	
<i>Bombycilla cedrorum</i>	cedar waxwing			x	
<i>Bombycilla garrula</i>	bohemian waxwing			x	
<i>Calamospiza melanocorys</i>	lark bunting		x		
<i>Carpodacus cassinii</i>	Cassin's finch			x	x
<i>Carpodacus mexicanus</i>	house finch		x		x
<i>Catherpes mexicanus</i>	canon wren		x	x	x
<i>Certhia familiaris</i>	brown creeper			x	x
<i>Chondestes grammacus</i>	lark sparrow		x	x	
<i>Cinclus mexicanus</i>	dipper	x		x	x
<i>Cistothorus palustris</i>	long-billed marsh wren	x	x	x	x
<i>Contopus pertinax</i>	Coues' flycatcher			x	x
<i>Contopus sordidulus</i>	western wood pewee	x		x	x
<i>Corvus brachyrhynchos</i>	common crow	x		x	x
<i>Corvus corax</i>	common raven			x	x
<i>Cyanocitta cristata</i>	blue jay		x		x
<i>Cyanocitta stelleri</i>	Steller's jay			x	x
<i>Dendroica auduboni</i>	yellow-rumped warbler			x	x
<i>Dendroica caerulescens</i>	black-throated blue warbler			x	
<i>Dendroica graciae</i>	Grace's warbler			x	x
<i>Dendroica magnolia</i>	magnolia warbler				x
<i>Dendroica nigrescens</i>	black-throated gray warbler			x	
<i>Dendroica occidentalis</i>	hermit warbler			x	x
<i>Dendroica palmarum</i>	palm warbler			x	
<i>Dendroica petechia</i>	yellow warbler	x		x	x
<i>Dendroica townsendi</i>	Townsend's warbler	x		x	x
<i>Dendroica virens</i>	black-throated green warbler				x
<i>Dumetella carolinensis</i>	gray catbird		x	x	
<i>Empidonax difficilis</i>	western flycatcher	x		x	x
<i>Empidonax hammondii</i>	Hammond's flycatcher	x			x
<i>Empidonax oberholseri</i>	dusky flycatcher				x
<i>Empidonax trailii</i>	willow flycatcher	x			x
<i>Empidonax wrightii</i>	gray flycatcher		x	x	
<i>Eremophila alpestris</i>	horned lark		x		
<i>Euphagus cyanocephalus</i>	Brewer's blackbird	x	x		
<i>Geothlypis trichas</i>	common yellowthroat	x			

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Guiraca caerulea</i>	blue grosbeak		X	X	
<i>Gymorhinus cyanocephalus</i>	pinon jay			X	
<i>Hesperiphona vespertina</i>	evening grosbeak			X	X
<i>Hirundo rustica</i>	barn swallow		X		
<i>Hylocichla guttata</i>	hermit thrush	X			X
<i>Hylocichla ustulata</i>	Swainson's thrush	X		X	X
<i>Icteria virens</i>	yellow-breasted chat	X	X		
<i>Icterus glabella</i>	northern oriole		X		
<i>Icterus parisorum</i>	Scott's oriole		X	X	
<i>Iridoprocne bicolor</i>	tree swallow	X		X	X
<i>Junco caniceps</i>	gray-headed junco			X	X
<i>Junco oreganus</i>	dark-eyed junco	X		X	X
<i>Lanius excubitor</i>	northern shrike		X		
<i>Lanius ludovicianus</i>	loggerhead shrike		X	X	
<i>Leucosticte australis</i>	brown-capped rosy finch	X			
<i>Leucosticte atrata</i>	black rosy finch	X		X	X
<i>Leucosticte tephrocotis</i>	gray-crowned rosy finch	X		X	X
<i>Loxia curvirostra</i>	red crossbill				X
<i>Maietilta varia</i>	black and white warbler			X	
<i>Melospiza lincolni</i>	Lincoln's sparrow	X			
<i>Melospiza melodia</i>	song sparrow		X		
<i>Mimus polyglottus</i>	mockingbird		X	X	X
<i>Molothrus ater</i>	brown-headed cowbird	X		X	X
<i>Myadestes townsendi</i>	Townsend's solitaire			X	X
<i>Myiarchus cinerascens</i>	ash-throated flycatcher		X	X	X
<i>Nucifraga columbiana</i>	Clark's nutcracker				X
<i>Nuttalornis borealis</i>	olive-sided flycatcher	X			X
<i>Oporonis tolmiei</i>	MacGillivray's warbler	X			X
<i>Oreoscoptes montanus</i>	sage thrasher		X		
<i>Parus atricapillus</i>	black-capped chickadee	X		X	X
<i>Parus gambeli</i>	mountain chickadee	X		X	X
<i>Parus inornatus</i>	plain titmouse			X	
<i>Paserina amoena</i>	lazuli bunting		X	X	
<i>Passer domesticus</i>	house sparrow		X	X	
<i>Passerculus sandwichensis</i>	savannah sparrow		X		
<i>Passerella iliaca</i>	fox sparrow		X		
<i>Passerina cyanea</i>	indigo bunting		X	X	
<i>Perisoreus canadensis</i>	gray jay				X
<i>Petrechelidon pyrrhonata</i>	cliff swallow		X		
<i>Pheuticus ludovicianus</i>	rose-breasted grosbeak			X	
<i>Pheuticus melanocephalus</i>	black-headed grosbeak	X			X
<i>Pica pica</i>	black-billed magpie	X	X	X	X
<i>Pipilo chlorurus</i>	green-tailed towhee	X	X		
<i>Pipilo fuscus</i>	brown towhee		X	X	

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Pipilo erythrophthalmus</i>	rufous-sided towhee	x	x		
<i>Piranga flava</i>	hepatic tanager				x
<i>Piranga ludoviciana</i>	western tanager	x		x	x
<i>Piranga olivacea</i>	scarlet tanager	x			x
<i>Poecetes gramineus</i>	vesper sparrow		x		
<i>Poliophtila caerulea</i>	blue-gray gnatcatcher		x	x	
<i>Progne subis</i>	purple martin				x
<i>Psaltiriparus minimus</i>	common bushtit	x		x	x
<i>Quiscalus mexicanus</i>	great-tailed grackle	x			
<i>Quiscalus quiscula</i>	common grackle	x			
<i>Regulus calendula</i>	ruby-crowned kinglet			x	x
<i>Regulus satrapa</i>	golden-crowned kinglet				x
<i>Riparia riparia</i>	bank swallow		x	x	
<i>Salpinctes obsoletus</i>	rock wren			x	x
<i>Sayornis nigricans</i>	black phoebe		x		
<i>Sayornis phoebe</i>	eastern phoebe		x		
<i>Sayornis saya</i>	Say's phoebe		x		
<i>Seiurus noveberacensis</i>	northern waterthrush	x			
<i>Seiurus aurocapillus</i>	ovenbird			x	
<i>Setophaga ruticilla</i>	American redstart			x	
<i>Sialia currocoides</i>	mountain bluebird			x	x
<i>Sialia mexicana</i>	western bluebird	x		x	x
<i>Sialia sialis</i>	eastern bluebird			x	
<i>Sitta canadensis</i>	red-breasted nuthatch	x		x	x
<i>Sitta carolinensis</i>	white-breasted nuthatch	x		x	x
<i>Sitta pygmaea</i>	pygmy nuthatch	x		x	x
<i>Spinus lawrencei</i>	Lawrence's goldfinch	x			
<i>Spinus pinus</i>	pine siskin	x			x
<i>Spinus psaltris</i>	lesser goldfinch	x			
<i>Spinus tristis</i>	American goldfinch	x	x	x	
<i>Spiza americana</i>	dickcissel		x		
<i>Spizella arborea</i>	tree sparrow		x	x	
<i>Spizella breweri</i>	Brewer's sparrow			x	
<i>Spizella passerina</i>	chipping sparrow	x		x	x
<i>Stelgidopteryx ruficollis</i>	rough-winged swallow	x			
<i>Sturnella magna</i>	eastern meadowlark	x	x		
<i>Sturnella neglecta</i>	western meadowlark	x	x		
<i>Sturnus vulgaris</i>	starling		x		x
<i>Thryomanes bewickii</i>	Bewick's wren	x		x	x
<i>Toxostoma bendirei</i>	Bendire's thrasher		x	x	
<i>Toxostoma rufum</i>	brown thrasher		x		
<i>Trachycynera thalassina</i>	violet-green swallow				x
<i>Troglodytes aedon</i>	house wren	x		x	x
<i>Turdus migratorius</i>	American robin	x		x	x

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Tyrannus tyrannus</i>	eastern kingbird	x			
<i>Tyrannus verticalis</i>	western kingbird		x	x	
<i>Tyrannus vociferans</i>	Cassin's kingbird	x		x	x
<i>Vermivora celata</i>	orange-crowned warbler				x
<i>Vermivora luciae</i>	Lucy's warbler	x	x		
<i>Vermivora ruficapilla</i>	nashville warbler			x	
<i>Vermivora virginiae</i>	Virginia's warbler	x		x	x
<i>Vireo gilvus</i>	warbling vireo	x		x	x
<i>Vireo olivaceus</i>	red-eyed vireo			x	
<i>Vireo solitarius</i>	solitary vireo	x		x	x
<i>Vireo vicinior</i>	gray vireo			x	
<i>Wilsonia pusilla</i>	Wilson's warbler	x	x		
<i>Xanthocephalus xanthocephalus</i>	yellow-headed blackbird	x			
<i>Zonotrichia</i>	white-crowned sparrow	x		x	
<i>Zonotrichia querula</i>	Harris' sparrow		x		
<i>Podiceps auritus</i>	horned grebe		x		
<i>Podiceps caspicus</i>	eared grebe		x		
<i>Aechmophorus occidentalis</i>	western grebe		x		
<i>Podilymbus podiceps</i>	pied-billed grebe	x			
<i>Pelecanus erythrorhynchos</i>	white pelican		x		
<i>Phalacrocorax auritus</i>	double-crested cormorant	x			
<i>Ardea herodias</i>	great blue heron	x			
<i>Butorides striatus</i>	green heron		x		
<i>Casmerodius albus</i>	great egret		x		
<i>Leucophoyx thula</i>	snowy egret		x		
<i>Nycticorax nycticorax</i>	black-crowned night heron	x			
<i>Ixobrychus exilis</i>	least bittern		x		
<i>Botaurus lentiginosus</i>	American bittern	x			
<i>Plegadis chihi</i>	white-faced ibis	x			
<i>Olor columbianus</i>	whistling swan	x			
<i>Branta canadensis</i>	Canada goose		x		
<i>Anser albifrons</i>	white-fronted goose	x			
<i>Chen hyperborea</i>	snow goose		x		
<i>Anas platyrhynchos</i>	mallard		x		
<i>Anas strepera</i>	gadwall		x		
<i>Anas acuta</i>	pintail		x		
<i>Anas carolinensis</i>	green-winged teal	x			
<i>Anas discors</i>	blue-winged teal	x			
<i>Anas cyanoptera</i>	cinnamon teal		x		
<i>Mareca americana</i>	American wigeon	x			
<i>Spatula clypeata</i>	northern shoveler	x			
<i>Aix sponsa</i>	wood duck		x		
<i>Aythya americana</i>	redhead		x		
<i>Aythya collaris</i>	ring-necked duck	x			

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Aythya valisineria</i>	canvasback		X		
<i>Aythya affinis</i>	lesser scaup		X		
<i>Bucephala clangula</i>	common goldeneye	X			
<i>Bucephala islandica</i>	Barrow's goldeneye	X			
<i>Bucephala albeola</i>	bufflehead		X		
<i>Melanitta perspicillata</i>	surf scooter		X		
<i>Oxyura jamaicensis</i>	ruddy duck		X		
<i>Lophodytes cucullatus</i>	hooded merganser	X			
<i>Mergus merganser</i>	common meganser	X			
<i>Mergus serrator</i>	red-breasted merganser	X			
<i>Ictinia mississippiensis</i>	Mississippi kite	X			
<i>Rallus limicola</i>	Virginia rail		X		
<i>Porzana carolina</i>	sora		X		
<i>Gallinula chloropus</i>	common gallinule	X			
<i>Fulica americana</i>	American coot	X			
<i>Notiosorex crawfordi</i>	desert shrew		X	X	
<i>Sorex merriami</i>	merriam shrew		X	X	
<i>Sorex nanua</i>	dwarf shrew				X
<i>Sorex vagrans</i>	vagrant shrew				X
<i>Antrozous pallidus</i>	pallid bat	X	X	X	X
<i>Eptesicus fuscus</i>	big brown bat	X		X	X
<i>Euderma maculata</i>	spotted bat			X	X
<i>Lasiurus borealis</i>	red bat			X	X
<i>Lasionycteris noctivagans</i>	silver-haired bat	X	X	X	X
<i>Lasiurus cinereus</i>	hoary bat	X		X	X
<i>Myotis californicus</i>	California myotis	X	X	X	X
<i>Myotis evotis</i>	long-eared myotis				X
<i>Myotis leibii</i>	small-footed myotis		X	X	X
<i>Myotis lucifugus</i>	little brown myotis	X	X	X	X
<i>Myotis subulatus</i>	small-footed myotis	X	X	X	X
<i>Myotis thysanodes</i>	fringed myotis	X	X	X	X
<i>Myotis velifer</i>	cave myotis		X	X	
<i>Myotis volans</i>	long-legged myotis	X	X	X	X
<i>Myotis yumanensis</i>	Yuma myotis	X	X	X	
<i>Pipistrellus hesperus</i>	western pipistrel	X	X	X	X
<i>Plecotus townsendi</i>	Townsend's big-eared bat	X	X	X	X
<i>Tadarida brasiliensis</i>	Mexican free-tailed bat	X	X	X	
<i>Tadarida macrotis</i>	big free-tailed bat	X	X	X	
<i>Sylvilagus auduboni</i>	desert cottontail rabbit	X	X	X	
<i>Sylvilagus floridanus</i>	eastern cottontail rabbit			X	X
<i>Sylvilagus nuttali</i>	Nuttall's cottontail rabbit	X			
<i>Lepus californicus</i>	blacktail jackrabbit	X	X	X	X
<i>Ammospermophilus leucurus</i>	w.t. antelope g. squirrel	X	X		
<i>Castor canadensis</i>	beaver		X		

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Cynomys gunnisoni</i>	Gunnison's prairie dog	x	x	x	x
<i>Dipodomys ordi</i>	Ord's kangaroo rat		x	x	
<i>Dipodomys spectabilis</i>	banner-tailed kangaroo rat		x		
<i>Erethizon dorsatum</i>	porcupine	x	x	x	x
<i>Eutamias dorsalis</i>	cliff chipmunk			x	x
<i>Eutamias minimus</i>	least chipmunk				x
<i>Eutamias quadrivittatus</i>	Colorado chipmunk			x	x
<i>Microtus pennsylvanicus</i>	meadow vole		x		
<i>Microtus montanus</i>	mountain vole				x
<i>Microtus mexicanus</i>	Mexican vole			x	x
<i>Microtus longicaudus</i>	long-tailed vole				x
<i>Mus musculus</i>	house mouse		x	x	
<i>Neotoma albigula</i>	white-throated woodrat		x	x	x
<i>Neotoma cinerea</i>	bushy-tailed woodrat			x	x
<i>Neotoma mexicana</i>	Mexican woodrat			x	x
<i>Neotoma stephensi</i>	Stephen's woodrat			x	
<i>Ondatra zibethica</i>	muskrat		x		
<i>Onychomys leucogaster</i>	northern grasshopper mouse		x	x	
<i>Perognathus flavus</i>	silky pocket mouse		x	x	
<i>Perognathus flavescens</i>	plains pocket mouse		x	x	
<i>Peromyscus boylei</i>	brush mouse			x	
<i>Peromyscus crinitus</i>	canyon mouse			x	
<i>Peromyscus difficilis</i>	rock mouse			x	
<i>Peromyscus leucopus</i>	white-footed mouse			x	
<i>Peromyscus maniculatus</i>	deer mouse	x	x	x	x
<i>Peromyscus truei</i>	pinon mouse		x	x	
<i>Reithrodontomys megalotis</i>	western harvest mouse	x	x	x	x
<i>Sciurus aberti</i>	Abert's squirrel				x
<i>Spermophilus spilosoma</i>	spotted ground squirrel		x		
<i>Spermophilus variegatus</i>	rock squirrel		x	x	
<i>Tamiasciurus hudsonicus</i>	red squirrel				x
<i>Thomomys bottae</i>	Botta's pocket gopher	x	x	x	x
<i>Thomomys talpoides</i>	northern pocket gopher				x
<i>Bassariscus astutus</i>	ring-tailed cat		x	x	
<i>Canis latrans</i>	coyote	x	x	x	x
<i>Felis concolor</i>	mountain lion	x		x	x
<i>Lynx rufus</i>	bobcat	x	x	x	x
<i>Lytra canadensis</i>	river otter		x		
<i>Martes americana</i>	marten				x
<i>Mephitis mephitis</i>	striped skunk	x	x	x	x
<i>Mustela frenata</i>	long-tailed weasel	x	x	x	x
<i>Mustela nigripes</i>	black-footed ferret		x	x	x
<i>Mustela vison</i>	mink		x		
<i>Procyon lotor</i>	raccoon	x	x	x	x

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Spilogale putorius</i>	western spotted skunk	x	x	x	x
<i>Taxidea taxus</i>	badger	x	x	x	x
<i>Urocyon cinereoargenteus</i>	gray fox	x	x	x	x
<i>Ursus americanus</i>	black bear	x		x	x
<i>Vulpes macrotis</i>	kit fox		x		
<i>Vulpes vulpes</i>	red fox		x	x	x
<i>Antilocapra americana</i>	pronghorn antelope		x		
<i>Cervus canadensis</i>	elk			x	x
<i>Odocoileus hemionus</i>	mule deer	x	x	x	x
<i>Ambystoma tigrinum</i>	tiger salamander	x	x	x	x
<i>Bufo cognatus</i>	great plains toad	x	x	x	
<i>Bufo punctatus</i>	red-spotted toad	x	x		
<i>Bufo woodhousei</i>	Woodhouse's toad	x	x	x	
<i>Hyla arenicolor</i>	canyon treefrog			x	
<i>Pseudacris triseriata</i>	chorus frog	x	x	x	x
<i>Rana catesbeiana</i>	bullfrog		x		
<i>Rana pipiens</i>	leopard frog	x			x
<i>Scaphiopus bombifrons</i>	plains spadefoot	x	x		x
<i>Scaphiopus hammondi</i>	western spadefoot	x	x	x	
<i>Scaphiopus intermountainus</i>	great plains spadefoot		x	x	
<i>Arizona elegans</i>	glossy snake		x		
<i>Cnemidophorus inornatus</i>	little striped whiptail		x		
<i>Cnemidophorus tigris</i>	western whiptail	x	x	x	
<i>Cnemidophorus velox</i>	plateau whiptail	x	x	x	
<i>Coluber constrictor</i>	racer	x	x	x	x
<i>Crotalis atrox</i>	western diamondback			x	
<i>Crotalis grahamiae</i>	mountain patch-nosed snake			x	
<i>Crotalis viridis</i>	western rattlesnake		x	x	x
<i>Crotophytus collaris</i>	collared lizard		x	x	
<i>Crotophytus wislezenii</i>	leopard lizard		x		
<i>Diadophis punctatus</i>	ring-necked snake			x	x
<i>Elaphe guttata</i>	corn snake	x	x	x	x
<i>Eumeces multivirgatus</i>	many-lined skink	x		x	x
<i>Holbrookia maculata</i>	esser earless lizard		x		
<i>Hypsiglena torquata</i>	night snake			x	
<i>Lampropeltus getulus</i>	common kingsnake	x	x	x	x
<i>Lampropeltus triangulum</i>	milk snake				x
<i>Masticophis flagellum</i>	coachwhip			x	
<i>Masticophis taeniatus</i>	striped whipsnake		x	x	
<i>Opheodrys vernalis</i>	smooth green snake	x			
<i>Phrynosoma douglassi</i>	short horned lizard		x	x	x
<i>Pituophis melanoleucus</i>	gopher snake	x	x	x	x
<i>Rheinocheilus lecontei</i>	long-nosed snake	x	x		
<i>Sauromalus obesus</i>	chuckwalla		x	x	

Species	Common Name	Habitat Types			
		Riparian	Arid	P/J	P/P
<i>Sceloporus graciosus</i>	sagebrush lizard		x	x	
<i>Sceloporus magister</i>	desert spiny lizard	x	x	x	
<i>Sceloporus undulatus</i>	eastern fence lizard	x	x	x	x
<i>Tantilla planiceps</i>	western black-headed snake	x	x	x	
<i>Thamnophis cryopsis</i>	black-necked garter snake	x			
<i>Thamnophis elegans</i>	western terrestrial garter	x	x	x	x
<i>Thamnophis sirtalis</i>	common garter snake	x			
<i>Urosaurus ornatus</i>	tree lizard		x	x	x
<i>Uta stansburiana</i>	side-blotched lizard		x		
<i>Xantusia vigilis</i>	desert night lizard		x	x	



ATTACHMENT M

Soil and Geology Descriptions



SOIL AND GEOLOGY DESCRIPTIONS

SOILS GREAT GROUPS WITHIN THE NAVAJO-GALLUP WATER SUPPLY PROJECT AREA

Cambothids

Cambothids are the Aridisols that:

- (1) Have a cambic horizon that has its upper boundary within 100 centimeters of the soil surface
- (2) Have a soil temperature regime warmer than cryic
- (3) Do not have a duripan or an argillic, calcic, natric, petrocalcic, gypsic, petrogypsic, or salic horizon that has its upper boundary within 100 centimeters of the soil surface

These are the Aridisols with the least degree of soil development. These soils have a cambic horizon within 100 centimeters of the soil surface. They may have other diagnostic horizons, such as a petrocalcic, gypsic, or calcic horizon, but the upper boundary of these horizons must be below 100 centimeters of the soil surface. These soils are the most common Aridisols in the United States.

Haplargids

Haplargids are the Argids that:

- (1) Do not have a duripan or a petrocalcic, petrogypsic, gypsic, or calcic horizon that has an upper boundary within 150 centimeters of the soil surface
- (2) Do not have a natric horizon
- (3) Have a densic, lithic, or paralithic contact within 50 centimeters of the soil surface, or

- a. A clay increase of less than 15 percent (absolute) within a vertical distance of 2.5 centimeters either within the argillic horizon or at its upper boundary, or
- b. An argillic horizon that does not extend to 150 centimeters from the soil surface, has a clay decrease with increasing depth of 20 percent or more (relative) from the maximum clay content, or has either (1) hue of 10YR or yellower or chroma of 4 or less in the matrix of all horizons between depths of 100 and 150 centimeters or (2) hue of 10YR or yellower and value, moist, of 4 or more or value, dry, of 4 or less in less than 50 percent of the matrix

These are the Argids that have an argillic horizon but do not have a duripan or a petrocalcic, petrogypsic, calcic, gypsic, or natric horizon. These soils commonly have calcium carbonate accumulations within or below the argillic horizon. Haplargids commonly occur on late-Pleistocene surfaces or sediments.

Torriorthents

Torriorthents are the Orthents that have an aridic (or torric) moisture regime and have a soil temperature regime warmer than cryic. These are the dry Orthents of cool to hot, arid regions. They have an aridic (or torric) moisture regime and a temperature regime warmer than cryic. Generally, they are neutral or calcareous and are on moderate to very steep slopes. A few are on gentle slopes. Many of the gently sloping soils are on rock pediments, are very shallow, have a sandy-skeletal particle-size class, or are salty. Others are on fans where sediments are recent but have little organic carbon. The vegetation on Torriorthents commonly is sparse and consists mostly of xerophytic shrubs and ephemeral grasses and forbs. The vegetation on a few of the soils is saltgrass. Torriorthents are used mainly for grazing. They are extensive in the Western United States.

Torrifluvents

Torrifluvents are the Fluvents that have an aridic (or torric) moisture regime and a soil temperature regime warmer than cryic. These are the Fluvents of arid climates. Most of them have a high pH value and are calcareous, and a few are somewhat salty. The soils are subject to flooding, but most are not flooded frequently or for long periods. The larger areas that have a favorable topography and are close to a source of water commonly are irrigated. The natural vegetation on the Torrifluvents in the United States consisted mostly of grasses, xerophytic shrubs, and cacti, but in some parts of the world, the only vegetation on the soils has been irrigated crops because the sediments accumulated while the soils were being cultivated.

Torripsamments

Torripsamments are the Psamments that have an aridic (or torric) moisture regime and a soil temperature regime warmer than cryic. These are the cool to hot Psamments of arid climates. They have an aridic (or torric) moisture regime and a temperature regime warmer than cryic. Many of these soils are on stable surfaces, some are on dunes, some are stabilized, and some are moving. Torripsamments consist of quartz, mixed sands, volcanic glass, or even gypsum, and may have any color. Generally, they are neutral or calcareous and are nearly level to steep. The vegetation consists mostly of xerophytic shrubs, grasses, and forbs. Many of these soils support more vegetation than other soils with an aridic moisture regime, presumably because they lose less water as runoff. Some of the soils on dunes support a few ephemeral plants or have a partial cover of xerophytic and ephemeral plants. The shifting dunes may be devoid of plants in normal years. Most of the deposits are of late-Pleistocene or younger age. These soils are used mainly for grazing. They are extensive in the Western United States.

Table M-1.—Soil map unit classifications within the project area

Map unit name	Slope (%)	Depth (inches)	Erosion hazard ¹	Land capability classification ²	Project features ³
Aquima-Hawaikuh silt loams	1–5	>60	1 to 2	3e & 6c	m
Badland			4	8	c
Badland-Genats complex ⁴	35–60	20–40	3 to 4	7e	m
Badland-Rock complex			4	8	p
Benally fine sandy loam	1–5	>60	1 to 2	7s	a
Benally loamy sand	1–3	>60	1	6c	a
Breadsprings and Nahodish soils	0–2	>60	1	6c	m
Brimham-Benally-Genats association	0–45	20–60	1 to 3	7c & 7e	m
Buckle fine sandy loam	1–8	>60	1 to 2	6c	m
Buckle-Gapmesa-Barboncito complex	1–6	10–60	1 to 2	6c	m
Calladito-Elias association	1–6	>60	1 to 2	7e & 7s	c
Camac-Kimbeto-Badland association	0–50	20–40	1 to 4	7e & 7s	p
Chinde loam	0–5	>60	1 to 2	7s	a
Councilor-Eslendo-Calladito complex	2–25	5–60	1 to 3	6c & 7e	c
Doak-Shiprock complex	1–8	>60	1	7c	m
Doakum-Bettonnie complex	1–8	>60	1 to 2	6c	c
Fajada-Huerfano-Benally Complex	1–5	10–60	1 to 2	7c & 7s	m
Farb-Chipeta-Rock outcrop complex	2–30	5–20	1 to 4	7e & 7s	m
Farb-Rock outcrop-Badland complex	2–25	5–10	1 to 4	7s	a, m, p
Gyptur very fine sandy loam	0–3	40–60	1	7s	a, m, p
Hamburg clay loam	0–1	>60	1	6s	m
Jeddito-Escavada association	0–3	>60	1	6e & 7c	m
Jeddito loamy fine sand	0–2	>60	1	7c	m
Kimbeto-Huerfano complex	1–4	10–60	1	7c & 7s	a, m
Kimbeto loamy fine sand	0–4	40–60	1	7c	M
Littlehat-Persayo-Badland complex	3–45	10–40	1 to 4	7s	a, p

Table M-1.—Soil map unit classifications within the project area (continued)

Map unit name	Slope (%)	Depth (inches)	Erosion hazard ¹	Land capability classification ²	Project features ³
Littlehat-Persayo-Nataani complex	1–15	10–40	1 to 2	7c & 7s	a, m, p
Mesa fine sandy loam	1–4	>60	1 to 2	7c	M
Nageezi loamy fine sand	1–6	>60	1 to 2	7c	P
Norkiki-Kimnoli complex	1–8	5–40	1 to 2	7c & 7s	M
Notal-Escavada-Riverwash association	0–1	>60	1 to 4	6e & 7c	a, p
Notal-Hamburn complex	0–2	>60	1	6c & 7c	M
Notal sandy clay loam	0–1	>60	1	7c	a, m, p
Persayo-Fordbutte association	1–10	10–40	1 to 2	7c & 7s	m
Ravola very fine sandy loam	1–3	>60	1	7c	a, m, p
Razito-Shiprock complex	3–8	>60	1 to 2	7c	m
Rehobeth silty clay loam	0–1	>60	1	6c	m
Riverwash-Escawetter association	0–1	>60	1 to 4	7c	m
Shiprock-Farb complex	1–5	5–60	1 to 2	7c & 7s	m
Sparank-San Mateo-Zia complex	0–3	>60	1	6c	m
Starlake clay	1–3	>60	1	7s	c
Suwanee loam	0–1	>60	1	6c	m
Tsosie-Councilor-Blancot fine sandy loams	1–3	>60	1	6c	c
Tsebitai very fine sandy loam	1–3	>60	1	7c	a, m
Wingrock – rock outcrop association	4–15	>60	1 to 4	7c	m
Werito loam	1–3	20–40	1	7s	m
Zia sandy loam	1–5	>60	1 to 2	6c	m

¹ Erosion hazards: 1 = slight, 2 = moderate, 3 = severe, 4 = very severe.

² Land capability classification: See table M-2 for definitions.

³ Project features: a = Amarillo, c = Cutter, m = main, p = PNM laterals.

⁴ A complex is a map unit where both soils are of roughly equal dominance.

Table M-2.—Land capability definitions¹

Land capability classification	Class description
3	Soils in Class 3 have severe limitation that reduce the choice of plants or require special conservation practices, or both. When used for cultivated crops, the conservation practices are usually more difficult to apply and to maintain. They may be used for cultivated crops, pasture, woodland, range, or wildlife food and cover.
6	Soils in Class 6 have severe limitations that make them generally unsuited to cultivate and limit their use largely to pasture or range, woodland, or wildlife food and cover. Physical conditions of these soils are such that it is practical to apply range or pasture improvements, if needed, such as seeding, liming, fertilizing, and water control with contour furrows, drainage, diversions, or water spreaders.
7	Soils in Class 7 have severe limitations that make them unsuited and restrict their use largely to grazing, woodland, or wildlife. Physical conditions of these soils are such that it is impractical to apply pasture or range improvements.
8	Soils and landforms in Class 8 have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or aesthetic purposes. Badlands, rock outcrops, sandy beaches, river washes, mine tailings, and other nearly barren lands are include in Class 8.
Capability subclass	Subclass description
c	Climatic limitations – Made up of soils where the climate (temperature or lack of moisture) is the only major hazard or limitation in their use.
e	Erosion – Made up of soils where excess water is the dominant hazard or limitation in their use. Erosion susceptibility and past erosion damage are the major soil factors for placing soils in this subclass.
s	Soil limitation – Includes, as the name implies, soils that have such limitations as shallowness of rooting zones, stones, low moisture-holding capacity, low fertility difficult to correct, salinity, and sodium.

¹ Taken from the National Soils Survey Handbook, Part 622—Ecological and Interpretive Groups (Natural Resource Conservation Service, 2001).

GEOLOGIC MAP UNITS WITHIN THE PROJECT AREA

Alluvium (Holocene) – Stream-deposited clay, silt, sand, and gravel on valley floors and in lowest terraces. Includes some fan and sheetwash alluvium. As much as 10 meters thick.

San Jose Formation (Eocene) – Sandstone, shale, and minor conglomerate. Divided into three units in some areas (Baltz, 1967). Thickness as much as 600 meters.

Nacimiento Formation (Paleocene) – Gray to olive-gray shale; minor interbedded sandstone in southwest, but in northeast nearly one-half of formation is sandstone. Grades into the Animas Formation to the north. Thickness as much as 580 meters.

Ojo Alamo Formation (Paleocene) – Brown crossbedded sandstone containing spherical-pebble conglomerate composed of quartzite and chert clasts near base. Grades laterally into the lower part of the Animas Formation to the north. Contains abundant petrified wood. Thickness of 25–65 meters.

Undivided (Upper Cretaceous) – Undivided.

Kirkland and Fruitland Formations (Upper Cretaceous) – Undivided.

Kirkland Shale – Upper most part is grayish mudstone, claystone, and sandstone; medial part is Farmington Sandstone Member; and lower part is greenish-gray mudstone and claystone (Mytton, 1979). Thickness of 25–30 meters.

Fruitland Formation – Gray, brown, and black mudstone and shale; yellowish-brown, crossbedded sandstone; and coal. Thickness of 25–45 meters.

Pictured Cliff Sandstone (Upper Cretaceous) – Upper part is yellowish-gray to grayish-orange marine sandstone; lower part is interbedded, brown sandstone and gray shale. Thickness 0–78 meters.

Cliff House Sandstone – Tan, fine- to medium-grained marine sandstone and minor shale; mapped separately in southwestern part of area. Thickness of 12 meters near Tierra Amarilla to about 420 meters near Bloomfield (subsurface).

Meneffe Formation – Tan and brown sandstone, gray and brown claystone and shale, coal, and layers of large ironstone and limestone concretions; mapped separately in southwestern part of area, but not in central part. Thickness ranges from 4 meters near Chama to about 450 meters near Chaco Culture National Historic Park.

Point Lookout Sandstone – Tan and brown marine sandstone and lesser amount of gray shale; mapped with Mesaverde Group; not mapped separately. Thickness ranges from 12 meters near Tierra Amarilla to 46 meters near Chaco Culture National Historic Park.

Crevasse Canyon Formation – Coal-bearing units are Ditco and Gibson Coal Members; other members are Bortiett Barren, Dalton Sandstone, and Borrego Pass Sandstone (or Lentil).

Gallup Sandstone – Generally regressive marine sandstone, Turonian.

Mancos Shale (Upper Cretaceous) – Composed of three members. Undivided near Nacimiento Mountains. Total thickness ranges from 570–770 meters.

Morrison Formation (Upper Jurassic) – Grayish-orange, fine- to medium-grained sandstone, greenish-gray and red mudstone, red claystone, and some conglomerate in upper part. Thickness of about 270 meters.

San Rafael Group (Middle Jurassic) – Consists of Entrada Sandstone, Todilto, and Summerville Formations; Bluff Sandstone and locally Zuni Sandstone (or only Acoma Tongue of Zuni).

Chinle Group (Upper Triassic) – Consists of four members. Thickness of 210–430 meters.

Upper Shale Member – Interbedded, variegated red, green, and maroon shale and red siltstone and lenticular sandstone. Thickness 150–200 meters.

Poleo Sandstone Lentil – Greenish-gray, very fine- to coarse-grained, micaceous conglomeratic sandstone with subordinate green and reddish-maroon shale and minor pellet limestone. Thickness of 7–80 meters.

Salitral Shale Tongue – Maroon shale with subordinate green shale and, locally, some very coarse-grained, green calcareous sandstone. Thickness of 100–110 meters.

Agua Zarca Sandstone Member – White to light-buff, fine- to coarse-grained, very thick-bedded quartzose sandstone, conglomerate, and conglomeratic sandstone. Thickness of 1–40 meters.



ATTACHMENT N

Hydrologic Determination, 2007

**HYDROLOGIC DETERMINATION
2007**

**Water Availability from Navajo Reservoir and
the Upper Colorado River Basin for Use in New Mexico**

April 2007

MAY 23 2007

Date


Secretary of the Interior

I. Executive Summary

Determination as to the availability of water under long-term service contracts for uses from Navajo Reservoir involves a projection into the future of estimated water uses and water supplies. On the basis of this hydrologic investigation, water depletions by the Upper Basin states from the Upper Colorado River Basin can be reasonably allowed to rise to an annual average of 5.76 million acre-feet (maf) per year, exclusive of Colorado River Storage Project (CRSP) reservoir evaporation from Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit. This depletion level can be achieved under the same shortage criteria upon which the allowable Upper Basin yield was determined in the 1988 Hydrologic Determination.

This document determines the availability through at least 2060 of water from New Mexico's Upper Basin allocation and Navajo Reservoir to service a proposed contract for the Navajo Nation's consumptive uses in New Mexico under the Navajo-Gallup Water Supply Project in the annual amount of 20,780 acre-feet (af) and the Navajo Indian Irrigation Project (NIIP) in the amount of 270,000 af per year on average over any period of ten consecutive years. It also is likely that sufficient water will be available from Navajo Reservoir to service the proposed contract after the 2060 planning horizon, depending upon future storage, hydrologic conditions, and other factors. This determination does not guarantee that the United States will be able to deliver water under the proposed contract without shortages in deliveries, and does not obligate the United States to maintain storage facilities beyond their useful lives. The proposed contract is part of a Navajo Nation water rights settlement in the Upper Basin in New Mexico, and the settlement provides that uses made pursuant to the contract will be subject to administration in accordance with the Upper Colorado River Basin Compact and New Mexico state law. Implementation of the Navajo-Gallup Water Supply Project and the NIIP is subject to compliance with federal environmental laws including the National Environmental Policy Act and the Endangered Species Act.

II. Introduction

The State of New Mexico has proposed the Navajo-Gallup Water Supply Project to provide a renewable water supply from the San Juan River for municipal and domestic uses for Indian and non-Indian communities located within New Mexico. Uses under the project by the Jicarilla Apache Nation and the City of Gallup would be supplied through the Jicarilla Apache Nation's Navajo Reservoir water supply contract approved by Congress in 1992. Uses in New Mexico under the project by the Navajo Nation would be supplied through a proposed new Navajo Reservoir water supply contract that is a component of the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (hereinafter referred to as the Settlement Agreement) that the State of New Mexico and the Navajo Nation executed on April 19, 2005. The new contract also would supersede the existing Navajo Reservoir water supply contract for the NIIP.

On June 19, 2003, the Upper Colorado River Commission resolved that the States of the Upper Division consent to the Navajo-Gallup Water Supply Project, provided that water diverted by the project for use in New Mexico shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III(a) of the Upper Colorado River Basin Compact. The maximum amount of consumptive use through the project by the Navajo Nation in New Mexico that would be permitted in any one year under the Settlement Agreement and the proposed contract is 20,780 acre-feet.

Public Law 87-483 at section 11(a) requires that no long-term contract, except contracts for the NIIP and the San Juan-Chama Project, shall be entered into for the delivery of water stored in Navajo Reservoir, or any other waters of the San Juan River and its tributaries to which the United States is entitled, until the Secretary of the Interior has determined by hydrologic investigation that sufficient water to fulfill such contract is reasonably likely to be available for use in the State of New Mexico under the allocations made in Articles III and XIV of the Upper Colorado River Basin Compact, has submitted such determination to Congress, and Congress has approved the contract. The last such hydrologic determination was approved by the Secretary on February 2, 1989 (Hydrologic Determination, 1988, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico, hereinafter referred to as the 1988 Hydrologic Determination). The 1988 Hydrologic Determination evaluated the availability of water from the Navajo Reservoir water supply for the Jicarilla Apache Nation's Navajo Reservoir water supply contract. The State of New Mexico, by letter dated May 3, 2005, requested that the 1988 Hydrologic Determination be updated to evaluate the availability of water to service the proposed Navajo-Gallup Water Supply Project.

This hydrologic investigation is made for the purpose of contracting for water from the Navajo Reservoir water supply for the Navajo Nation's uses in New Mexico under the Navajo-Gallup Water Supply Project. The Bureau of Reclamation prepared this hydrologic investigation in consultation with the Upper Colorado River Commission because of the critical nature of this determination of the Upper Basin water supply. The Upper Colorado River Basin Compact created and defined several areas of responsibility for the Commission that directly and indirectly relate to this investigation.

III. Upper Basin Yield

A. General Upper Basin Hydrology

Based on the Bureau of Reclamation's Colorado River Simulation System (CRSS), natural flows for the period 1906-2000, the natural runoff from the Upper Colorado River Basin averages about 15.3 maf per year at Lee Ferry. Of this amount, approximately 2 maf per year originates in the San Juan River Basin above Bluff, Utah. New Mexico can only develop its Upper Basin allocation from the San Juan River and its tributaries. The Bureau of Reclamation's Colorado River System Consumptive Uses and Losses Report for 1996-2000 indicates that current consumptive uses from the San Juan River Basin

average about 382,400 af per year in New Mexico and about 192,500 af per year in Colorado. Only minor amounts of depletions are made in the San Juan River Basin in Utah and Arizona.

B. Approach

This hydrologic investigation considers and uses many of the same basic assumptions as the 1988 Hydrologic Determination. Both investigations assume use of the CRSS natural flows at Lee Ferry, minimum releases from Lake Powell of between 7.48 maf and 8.23 maf annually, an allowable overall shortage of no more than 6 percent for a critical period, either maintenance or use of the minimum power pools at CRSP units, reduced storage capacity in Lake Powell due to sedimentation, and inclusion of bank storage. The CRSS natural flows at Lee Ferry for the period 1971-1980 were increased to reflect recalculation of historic irrigation depletions in the Upper Basin using the Soil Conservation Service (SCS) modified Blaney-Criddle method with SCS effective precipitation. The revised CRSS natural flows for 1971-1980 are consistent with the CRSS natural flows at Lee Ferry determined for the remainder of the 1906-2000 period of record. Also, sedimentation in Lake Powell was adjusted to reflect a 2060 planning horizon, and a 4 percent bank storage factor was used in this investigation consistent with Reclamation's current CRSS model.

Neither the Lower Division states nor the Upper Colorado River Commission agree with the modeling assumption for the objective minimum release used in this report. At the request of the Commission, this hydrologic investigation considers for planning purposes both the objective minimum release of 8.23 maf and a minimum release from Lake Powell of 7.48 maf annually. However, this hydrologic determination does not quantify the Colorado River Compact Article III(c) requirement or make or rely on a critical compact interpretation regarding Article III(c). The 1988 Hydrologic Determination also showed the Upper Basin yields under these minimum release scenarios.

Mass balance analyses were used to analyze potential water use by the Upper Basin under 2060 conditions. The mass balance considers Upper Basin reservoir storage, natural flows at Lee Ferry, deliveries to the Lower Basin, consumptive use demands in the Upper Basin, and CRSP evaporation as a function of storage volume. All existing Upper Basin storage capacity was included in the analysis because all storage supports water use in the Upper Basin and impacts stream flows. The CRSP and non-CRSP reservoirs as groups were assumed to be the same percent full each year, and CRSP storage was assumed to be distributed between units in accordance with the average historic storage distribution. The CRSP reservoir evaporation that is used in the mass balance analyses includes evaporation from Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit that is shared among the Upper Division States, but excludes evaporation from Navajo Reservoir which is chargeable to the states based on use. Shared CRSP reservoir evaporation is modeled using a regression equation relating historic shared CRSP reservoir evaporation from Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit to the aggregate historic storage volume in these reservoirs plus Navajo Reservoir. Evaporation equations were developed for both active and live storage, and were applied

to estimate annual shared CRSP evaporation based upon yearly reservoir storage volume (surface area). The 1988 Hydrologic Determination considered variations in shared CRSP reservoir evaporation with storage for conducting statistical trace analyses to evaluate possible frequencies and magnitudes of shortages; however, it deducted a long-term average shared CRSP reservoir evaporation of 0.52 maf per year from the critical-period Upper Basin yield of at least 6.0 maf/yr to determine the amount of water available for Upper Basin uses through the critical period.

C. Results

Mass balance analyses were performed for various combinations of storage, Lower Basin deliveries, and overall shortages to evaluate the allocation of water to the Upper Basin (see mass balance analyses provided in Appendix A). The following is a summary of the results of the analyses:

<u>Storage Assumption</u>	Minimum Lower Basin Delivery (maf)	Yield without Shortages (maf)	Yield with 6% Overall Shortages (maf)
Maintain minimum power pools	8.25	5.55	5.79
	7.50	6.30	6.57
Use minimum power pools	8.25	5.72	5.98
	7.50	6.47	6.76

The yield for this analysis is defined as the amount of water available at Lee Ferry for use, on average, by the Upper Basin, exclusive of shared CRSP reservoir evaporation. Shortages in the above table are defined as 6 percent or less overall computed shortage for any period of 25 consecutive years consistent with the 1988 Hydrologic Determination. Results are shown for minimum Lower Basin deliveries of 8.25 maf and 7.50 maf as was done in the 1988 Hydrologic Determination. The analyses in this investigation should not be construed to prejudice the positions of either the Upper Colorado River Commission or the States of the Lower Division as to the interpretation or administration of Article III of the Colorado River Compact.

For those analyses that use an allowable or tolerable overall shortage of 6 percent or less of the use over any period of 25 consecutive years, the results indicate that there would be 5 years of shortage to meet all demands on the Upper Basin out of 95 years of record used in this investigation. However, the annual amounts of computed shortages for those five years would not fully materialize because Upper Basin consumptive uses will be below average under critical period hydrology due to physical water supply shortages at the sites of use in the Upper Basin. For example, the natural flow at Lee Ferry for 1977 was only 5.55 maf, and severe water supply shortages occurred throughout the Upper Basin in that year. The computations of shortage in this analysis give conservatively large estimates of annual shortages at Lee Ferry and do not fully reflect all factors,

including physical shortages in the Upper Basin that might contribute or relate to a shortage condition at any given time. The computed shortages in this investigation do not equate to administrative calls to curtail Upper Basin uses.

D. Comparison to 1988 Hydrologic Determination

The 1988 Hydrologic Determination concluded that the total Upper Basin yield, including CRSP reservoir evaporation, is at least 6.0 maf per year for the 1953-1977 critical period hydrology with a 6 percent allowable overall shortage for the period. Under the conditions assumed in the current investigation, the shared CRSP evaporation varies with CRSP storage assumptions and storage levels. Assuming an average annual Upper Basin use of 5.79 maf, an annual Lower Basin delivery of 8.25 maf, and maintenance of the power pools, the shared CRSP evaporation would range from an average of about 0.25 maf per year over the worst 25-year period of reservoir storage draw down (1953-1977) to an average of about 0.49 maf per year over the period of record used in the analysis (1906-2000). Thus, the total Upper Basin depletion, including both Upper Basin uses and CRSP reservoir evaporation, would average about 6.04 maf per year or more over any period of 25 consecutive years. The total Upper Basin depletion amount for this scenario for the 1953-1977 period is comparable to the total Upper Basin depletion of 6.0 maf per year determined to be available for the period by the 1988 Hydrologic Determination. The difference is due to the revisions made to the CRSS natural flows for 1971-1980. If the minimum power pools are used, the shared CRSP reservoir evaporation is reduced due to increased reservoir storage draw downs.

IV. Water Use Projections

A. Upper Basin

The Upper Colorado River Commission last approved depletions schedules for the Upper Division States for planning purposes in 1999. The depletions schedules, dated January 2000, project that the total Upper Basin use exclusive of shared CRSP reservoir evaporation will average about 5.37 maf per year under 2060 development conditions. Unless additional Upper Basin water development occurs by 2060 as compared to the January 2000 depletions schedules, the Upper Basin use may average less than about 5.40 maf per year from now through 2060. The time required to develop the Upper Basin allocation reduces risk of shortage within the 2060 planning horizon.

B. State of New Mexico

For use in this investigation, the New Mexico Interstate Stream Commission provided the Bureau of Reclamation with a preliminary revised schedule of anticipated depletions through 2060 from the Upper Basin in New Mexico dated May 2006 (see Appendix B). The revised depletions schedule includes irrigation depletions calculated using the SCS modified Blaney-Criddle method with SCS effective precipitation so that demands and supply for this hydrologic investigation are evaluated using consistent methodologies.

The irrigation depletions for the Navajo Nation's irrigation projects are water right depletion amounts provided by the Settlement Agreement. Both this hydrologic investigation and the 1988 Hydrologic Determination assume use of the full depletion amount for the NIIP. This is a conservative assumption because the total NIIP depletion right is not expected to be fully utilized under normal farm management practices. The revised depletions schedule does not include New Mexico's allocation of shared CRSP reservoir evaporation. The revised New Mexico depletions schedule shows a total anticipated depletion of 642,000 af per year, on average, for uses in New Mexico under 2060 development conditions. This represents an increase in New Mexico's total Upper Basin depletion, excluding shared CRSP reservoir evaporation, of 23,000 af per year, or about 0.02 maf per year, as compared to the January 2000 depletions schedules.

V. Probabilities of Calls to Curtail Upper Basin Uses

The 1988 Hydrologic Determination included a probabilistic risk analysis of administrative calls to curtail Upper Basin uses that indicated that: (1) such calls would occur rarely at an Upper Basin demand level of 6.1 maf per year, though their effects could have significant impact to the Upper Basin; and (2) the frequency and magnitude of such calls would diminish rapidly below this demand level. The risk analysis was made using the CRSS model. It is not necessary for this investigation to duplicate such a risk analysis.

The computations of shortage in this current investigation give conservatively large estimates of annual shortages at Lee Ferry and do not fully reflect all factors, including physical shortages in the Upper Basin that might contribute or relate to a shortage condition at any given time. While this investigation uses a 2060 reservoir storage sedimentation condition for Lake Powell, a risk analysis should vary the storage development and sedimentation conditions over time. In addition, it will take decades to develop the Upper Basin allocation. Therefore, risk of shortage is reduced within a 2060 planning horizon. Even using the CRSS model, computed shortages would not necessarily equate to administrative calls to curtail Upper Basin uses.

VI. Physical Availability of Water from Navajo Reservoir

The Bureau of Reclamation, using a detailed hydrologic model for the San Juan River Basin, has evaluated the physical availability of water from Navajo Reservoir and the San Juan River for the Navajo-Gallup Water Supply Project, taking into account, among other things, the habitat needs of San Juan River populations of fish species listed as endangered under the Endangered Species Act. The physical water supply analysis contained in the Biological Assessment, Navajo-Gallup Water Supply Project, dated August 16, 2005, indicates that sufficient water is likely to be available from the Navajo Reservoir water supply for the Navajo Nation's uses under the project. Although the depletions for individual uses in New Mexico that were used in the Biological Assessment differ slightly from those in New Mexico's May 2006 revised depletions

schedule, the physical water supply analysis in the Biological Assessment assumes up to about 640,500 af per year of depletion, on average, in New Mexico from the San Juan River. This amount of total average depletion in New Mexico is not significantly different than the amount of total average depletion in New Mexico shown in the May 2006 revised New Mexico depletions schedule under 2060 development conditions.

VII. Conclusions

It is concluded that based on the analysis performed by Reclamation in consultation with the Upper Colorado River Commission, the Upper Basin yield and New Mexico water allocation needed to support New Mexico's revised Upper Basin depletions schedule are reasonably likely to be available. The mass balance analyses results are sufficient to conclude that: (1) the Upper Basin yield is at least 5.76 maf per year, on average, excluding shared CRSP reservoir evaporation; (2) New Mexico's Upper Basin allocation is at least 642,400 af per year, excluding shared CRSP reservoir evaporation; and (3) the total anticipated average annual consumptive use in New Mexico from the Upper Basin, including Navajo Reservoir evaporation of 642,000 af per year as shown in the revised New Mexico depletions schedule is not likely to exceed New Mexico's Upper Basin allocation. This conclusion is reached assuming full use of the Navajo Nation's proposed depletion rights under the Settlement Agreement for both the Navajo-Gallup Water Supply Project and the NIIP.

Based upon this hydrologic investigation for a planning horizon through 2060, the May 2006 revised New Mexico depletions schedule, and the Biological Assessment for the Navajo-Gallup Water Supply Project, sufficient water is reasonably likely to be available from the Navajo Reservoir water supply through at least 2060 to fulfill the contract that is proposed by the Settlement Agreement to provide water for the Navajo Nation's uses in New Mexico under the Navajo-Gallup Water Supply Project and the NIIP. If the term of the contract extends beyond 2060, or is perpetual as proposed by the Settlement Agreement, the risk of shortages in deliveries under the contract may increase after 2060 depending upon future storage, hydrologic conditions, and other factors. Section 11(a) of Public Law 87-483 allows for contracting of water from Navajo Reservoir up to a total amount that, in the event of shortage, still results in a reasonable amount of water being available for the diversion requirements of the NIIP and the San Juan-Chama Project.

VIII. Disclaimers

A. Interstate Compacts and Federal Laws

Nothing in this report is intended to interpret the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 between the United States of America and the United Mexican States (59 Stat. 1219), the decree entered by the Supreme Court of the United States in *Arizona v. California, et al.* (376 U.S. 340), the Boulder Canyon Project Act (45 Stat.

1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774), the Colorado River Storage Project Act (70 Stat. 105), or the Colorado River Basin Project Act (82 Stat. 885). Implementation of the Navajo-Gallup Water Supply Project and the NIIP is subject to compliance with federal environmental laws including the National Environmental Policy Act and the Endangered Species Act.

B. Proposed Navajo Reservoir Water Contract

This determination is not to be construed as acceptance by the Department of the Interior of the terms of the Settlement Agreement, including the terms of the proposed contract. This determination also does not guarantee that the United States would be able to deliver water under the proposed contract without shortages in deliveries on account of drought or other causes outside the control of the Secretary. Nothing in this determination shall be construed to impose on the United States any obligation to maintain CRSP storage facilities, including Navajo Dam and Reservoir, or NIIP or Navajo-Gallup Water Supply Project facilities beyond their useful lives or to take extraordinary measures to keep these facilities operating.

List of Appendices

APPENDIX A - Mass Balance Analysis

APPENDIX B - Reservoir Storage

APPENDIX C - CRSP Evaporation Analysis

APPENDIX D - New Mexico Depletion Schedule

APPENDIX E - Upper Colorado River Commission Resolution

APPENDIX A - Mass Balance Analysis

Upper Basin Yield Mass Balance Analysis

Run 1 - Maintain CRSP Minimum Power Pools, 8.25 maf Lower Basin Delivery, No Shortage

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage	Lower Basin Delivery	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables	
1906	18,550,021	29,530,030	24,847,704	8,250,000	5,550,000	749,290	33,530,761	4,000,731	0	29,530,030	24,847,704	Storage	30,167,576 af
1907	21,201,694	29,530,030	24,847,704	8,250,000	5,550,000	749,290	36,182,434	6,652,404	0	29,530,030	24,847,704	Sedimentation Rate (Active)	24,292 af/yr
1908	12,218,817	29,530,030	24,847,704	8,250,000	5,550,000	725,218	27,223,629	0	0	27,223,629	22,907,009	Bank Storage	4%
1909	22,356,301	27,223,629	22,907,009	8,250,000	5,550,000	725,218	35,054,712	5,524,682	0	29,530,030	24,847,704	Adjusted Storage (2060)	29,530,030 af
1910	14,650,616	29,530,030	24,847,704	8,250,000	5,550,000	749,290	29,631,356	101,326	0	29,530,030	24,847,704	UB Demand Level	5,550,000 af/yr
1911	15,499,729	29,530,030	24,847,704	8,250,000	5,550,000	749,290	30,480,469	950,439	0	29,530,030	24,847,704	LB Delivery	8,250,000 af/yr
1912	18,623,410	29,530,030	24,847,704	8,250,000	5,550,000	749,290	33,604,150	4,074,120	0	29,530,030	24,847,704		
1913	14,536,373	29,530,030	24,847,704	8,250,000	5,550,000	749,290	36,322,904	0	0	29,530,030	24,847,704		
1914	21,354,814	29,517,247	24,836,947	8,250,000	5,550,000	749,157	29,517,247	0	0	29,517,247	24,836,947		
1915	13,623,277	29,530,030	24,847,704	8,250,000	5,550,000	739,725	28,613,582	0	0	29,530,030	24,847,704		
1916	20,142,892	28,613,582	24,076,569	8,250,000	5,550,000	739,725	34,216,749	4,686,719	0	29,530,030	24,076,569	Results	
1917	22,942,804	29,530,030	24,847,704	8,250,000	5,550,000	749,290	37,923,544	8,393,514	0	29,530,030	24,847,704	Average CRSP Evap	527,920 af/yr
1918	15,865,939	29,530,030	24,847,704	8,250,000	5,550,000	749,290	30,846,679	1,316,649	0	29,530,030	24,847,704	Total Yield w/ CRSP evap	6,077,920 af/yr
1919	12,651,369	29,530,030	24,847,704	8,250,000	5,550,000	729,686	27,651,713	0	0	29,530,030	24,847,704		
1920	22,827,832	27,651,713	23,267,216	8,250,000	5,550,000	729,686	35,409,659	5,879,629	0	27,651,713	23,267,216	Shortage Years	Shortage
1921	22,942,804	29,530,030	24,847,704	8,250,000	5,550,000	749,290	37,923,544	7,877,491	0	29,530,030	24,847,704		
1922	18,447,198	29,530,030	24,847,704	8,250,000	5,550,000	749,290	33,427,938	3,897,908	0	29,530,030	24,847,704	1963	0 af
1923	19,024,046	29,530,030	24,847,704	8,250,000	5,550,000	749,290	34,004,786	4,474,756	0	29,530,030	24,847,704	1964	0 af
1924	13,877,798	29,530,030	24,847,704	8,250,000	5,550,000	742,354	28,865,474	0	0	28,865,474	24,288,521	1967	0 af
1925	14,430,701	28,865,474	24,288,521	8,250,000	5,550,000	734,337	28,761,839	0	0	28,761,839	24,201,318	1968	0 af
1926	15,213,731	28,761,839	24,201,318	8,250,000	5,550,000	740,284	29,435,286	0	0	29,435,286	24,767,982	1977	0 af
1927	19,539,212	29,435,286	24,767,982	8,250,000	5,550,000	748,301	34,426,197	4,896,166	0	29,530,030	24,847,704	NM allocation(w/o evap)	618,750 af/yr
1928	16,954,334	29,530,030	24,847,704	8,250,000	5,550,000	749,290	31,935,074	2,405,044	0	29,530,030	24,847,704		
1929	21,829,585	29,530,030	24,847,704	8,250,000	5,550,000	749,290	36,810,325	7,280,295	0	29,530,030	24,847,704		
1930	14,621,041	29,530,030	24,847,704	8,250,000	5,550,000	749,290	29,601,781	71,751	0	29,530,030	24,847,704		
1931	8,474,134	29,530,030	24,847,704	8,250,000	5,550,000	686,538	23,517,628	0	0	23,517,628	19,788,636	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1932	17,422,187	23,517,628	19,788,636	8,250,000	5,550,000	654,758	26,485,055	0	0	26,485,055	22,285,545		
1933	12,183,500	26,485,055	22,285,545	8,250,000	5,550,000	661,949	24,206,607	0	0	24,206,607	20,368,371		
1934	6,178,192	24,206,607	20,368,371	8,250,000	5,550,000	552,849	16,031,950	0	0	16,031,950	13,489,900		
1935	12,630,349	16,031,950	13,489,900	8,250,000	5,550,000	450,618	14,411,681	0	0	14,411,681	12,128,543	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	14,411,681	12,128,543	8,250,000	5,550,000	437,996	14,822,558	0	0	14,822,558	12,472,271	1953-1977	5,870,057 af/yr
1937	14,306,056	14,822,558	12,472,271	8,250,000	5,550,000	442,944	14,885,671	0	0	14,885,671	12,525,376	1931-1977	5,971,255 af/yr
1938	18,148,319	14,885,671	12,525,376	8,250,000	5,550,000	483,935	18,750,055	0	0	18,750,055	15,777,018	1906-2000	6,077,920 af/yr
1939	11,164,059	18,750,055	15,777,018	8,250,000	5,550,000	491,625	15,622,489	0	0	15,622,489	13,145,364		
1940	9,931,657	15,622,489	13,145,364	8,250,000	5,550,000	414,284	11,339,862	0	0	11,339,862	9,541,797		
1941	20,116,678	11,339,862	9,541,797	8,250,000	5,550,000	431,015	17,225,525	0	0	17,225,525	14,494,220	Flow Adjustments:	
1942	17,225,136	17,225,525	14,494,220	8,250,000	5,550,000	522,737	20,127,925	0	0	20,127,925	16,936,410	1971	203,226 af
1943	13,731,401	20,127,925	16,936,410	8,250,000	5,550,000	546,608	19,512,717	0	0	19,512,717	16,418,751	1972	226,985 af
1944	15,369,422	19,512,717	16,418,751	8,250,000	5,550,000	550,819	20,531,321	0	0	20,531,321	17,275,843	1973	252,377 af
1945	14,140,528	20,531,321	17,275,843	8,250,000	5,550,000	559,168	20,312,681	0	0	20,312,681	17,091,871	1974	196,384 af
1946	11,095,453	20,312,681	17,091,871	8,250,000	5,550,000	523,198	17,084,936	0	0	17,084,936	14,375,923	1975	246,665 af
1947	16,439,486	17,084,936	14,375,923	8,250,000	5,550,000	511,717	19,212,705	0	0	19,212,705	16,166,309	1976	173,250 af
1948	15,139,294	19,212,705	16,166,309	8,250,000	5,550,000	542,244	20,009,755	0	0	20,009,755	16,836,978	1977	112,291 af
1949	16,933,584	20,009,755	16,836,978	8,250,000	5,550,000	577,243	22,566,096	0	0	22,566,096	18,987,982	1978	152,187 af
1950	13,140,416	22,566,096	18,987,982	8,250,000	5,550,000	590,873	21,315,639	0	0	21,315,639	17,935,799	1979	153,559 af
1951	12,505,894	21,315,639	17,935,799	8,250,000	5,550,000	558,486	19,463,047	0	0	19,463,047	16,376,957	1980	161,893 af
1952	20,805,422	19,463,047	16,376,957	8,250,000	5,550,000	805,942	25,862,527	0	0	25,862,527	21,761,725		
1953	11,165,419	25,862,527	21,761,725	8,250,000	5,550,000	638,572	22,589,374	0	0	22,589,374	19,007,568		
1954	8,496,102	22,589,374	19,007,568	8,250,000	5,550,000	543,381	16,742,094	0	0	16,742,094	14,087,442		
1955	9,413,908	16,742,094	14,087,442	8,250,000	5,550,000	432,065	11,923,937	0	0	11,923,937	10,033,259		
1956	11,426,874	11,923,937	10,033,259	8,250,000	5,550,000	353,322	9,197,489	0	0	9,197,489	7,739,121		
1957	21,500,963	9,197,489	7,739,121	8,250,000	5,550,000	401,055	16,497,397	0	0	16,497,397	13,881,544		
1958	15,862,511	16,497,397	13,881,544	8,250,000	5,550,000	493,620	18,066,288	0	0	18,066,288	15,201,670		
1959	9,598,169	18,066,288	15,201,670	8,250,000	5,550,000	461,325	13,403,132	0	0	13,403,132	11,277,911		
1960	11,524,160	13,403,132	11,277,911	8,250,000	5,550,000	384,885	10,742,407	0	0	10,742,407	9,039,075		
1961	10,010,259	10,742,407	9,039,075	8,250,000	5,550,000	314,281	6,638,386	0	0	6,638,386	5,585,793		
1962	17,377,609	6,638,386	5,585,793	8,250,000	5,550,000	305,697	9,910,398	0	0	9,910,398	8,338,990		
1963	8,840,900	9,910,398	8,338,990	8,250,000	5,550,000	285,014	4,666,284	0	0	4,666,284	3,926,391		
1964	10,863,586	4,666,284	3,926,391	8,250,000	5,550,000	197,571	1,532,299	0	0	1,532,299	1,289,335		
1965	19,875,027	1,532,299	1,289,335	8,250,000	5,550,000	225,909	7,381,417	0	0	7,381,417	6,211,008		
1966	10,679,844	7,381,417	6,211,008	8,250,000	5,550,000	192,841	4,009,497	0	0	4,009,497	3,373,745		
1967	11,670,830	4,009,497	3,373,745	8,250,000	5,550,000	165,754	1,687,986	0	0	1,687,986	1,420,336		
1968	13,739,932	1,687,986	1,420,336	8,250,000	5,550,000	176,916	1,462,164	0	0	1,462,164	1,230,321		
1969	15,272,159	1,462,164	1,230,321	8,250,000	5,550,000	204,417	4,097,125	0	0	4,097,125	3,447,479		
1970	15,344,136	2,757,407	2,320,188	8,250,000	5,550,000	239,970	4,703,812	0	0	4,703,812	4,675,996		
1971	15,493,659	4,097,125	3,447,479	8,250,000	5,550,000	233,638	5,557,146	0	0	5,557,146	4,975,968		
1972	13,186,637	5,557,146	4,975,968	8,250,000	5,550,000	239,970	4,703,812	0	0	4,703,812	3,957,968		
1973	18,650,193	4,703,812	3,957,968	8,250,000	5,550,000	278,776	9,275,229	0	0	9,275,229	7,804,534		
1974	13,285,426	9,275,229	7,804,534	8,250,000	5,550,000	317,801	8,442,854	0	0	8,442,854	7,104,142		
1975	17,072,661	8,442,854	7,104,142	8,250,000	5,550,000	339,725	11,375,790	0	0	11,375,790	9,572,028		
1976	11,313,561	11,375,790	9										

Upper Basin Yield Mass Balance Analysis

Run 2 - Maintain CRSP Minimum Power Pools, 8.25 maf Lower Basin Delivery, 6% Overall Shortage

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables	
1906	18,550,021	29,530,030	24,847,704	8,250,000	5,790,000	749,290	33,290,761	3,760,731	0	29,530,030	24,847,704	Storage	30,167,576 af
1907	21,201,694	29,530,030	24,847,704	8,250,000	5,790,000	749,290	35,942,434	6,412,404	0	29,530,030	24,847,704	Sedimentation Rate (Active)	24,292 af/yr
1908	12,218,817	29,530,030	24,847,704	8,250,000	5,790,000	722,739	26,986,108	0	0	26,986,108	22,707,150	Bank Storage	4%
1909	22,356,301	26,986,108	22,707,150	8,250,000	5,790,000	722,739	34,579,670	5,049,640	0	29,530,030	24,847,704	Adjusted Storage (2060)	29,530,030 af
1910	14,650,616	29,530,030	24,847,704	8,250,000	5,790,000	747,858	29,392,789	0	0	29,392,789	24,732,223	UB Demand Level	5,790,000 af/yr
1911	15,499,729	29,530,030	24,847,704	8,250,000	5,790,000	747,858	30,104,660	574,629	0	29,530,030	24,847,704	LB Delivery	8,250,000 af/yr
1912	18,623,410	29,530,030	24,847,704	8,250,000	5,790,000	749,290	33,364,150	3,834,120	0	29,530,030	24,847,704		
1913	14,536,373	29,530,030	24,847,704	8,250,000	5,790,000	746,678	29,279,726	0	0	29,279,726	24,637,088		
1914	21,354,814	29,279,726	24,637,088	8,250,000	5,790,000	746,678	35,847,862	6,317,832	0	29,530,030	24,847,704		
1915	13,623,277	29,530,030	24,847,704	8,250,000	5,790,000	737,246	28,376,061	0	0	28,376,061	23,876,710	Results	
1916	20,142,892	28,376,061	23,876,710	8,250,000	5,790,000	737,246	33,741,707	4,211,677	0	29,530,030	24,847,704	Average CRSP Evap	491,413 af/yr
1917	22,942,804	29,530,030	24,847,704	8,250,000	5,790,000	749,290	37,683,544	8,153,514	0	29,530,030	24,847,704	Total Yield w/ CRSP evap	6,281,413 af/yr
1918	15,865,939	29,530,030	24,847,704	8,250,000	5,790,000	749,290	30,606,679	1,076,649	0	29,530,030	24,847,704		
1919	12,651,369	29,530,030	24,847,704	8,250,000	5,790,000	727,207	27,414,192	0	0	27,414,192	23,067,356	Shortage Years	Shortage
1920	22,287,632	27,414,192	23,067,356	8,250,000	5,790,000	727,207	34,934,617	5,404,587	0	29,530,030	24,847,704	1963	1,153,349 af
1921	22,526,781	29,530,030	24,847,704	8,250,000	5,790,000	749,290	37,267,521	7,737,491	0	29,530,030	24,847,704	1964	3,309,290 af
1922	18,447,198	29,530,030	24,847,704	8,250,000	5,790,000	749,290	33,187,398	3,657,908	0	29,530,030	24,847,704	1967	453,929 af
1923	19,024,046	29,530,030	24,847,704	8,250,000	5,790,000	749,290	33,764,786	4,234,756	0	29,530,030	24,847,704	1968	432,944 af
1924	13,877,798	29,530,030	24,847,704	8,250,000	5,790,000	739,875	28,627,953	0	0	28,627,953	24,088,662	1968	432,944 af
1925	14,430,701	28,627,953	24,088,662	8,250,000	5,790,000	726,951	28,291,704	0	0	28,291,704	23,805,728	1977	3,136,608 af
1926	15,213,731	28,291,704	23,805,728	8,250,000	5,790,000	728,092	28,737,342	0	0	28,737,342	24,180,706		
1927	19,539,212	28,737,342	24,180,706	8,250,000	5,790,000	741,017	33,495,537	3,965,507	0	29,530,030	24,847,704	NM allocation(w/o evap)	645,750 af/yr
1928	16,954,334	29,530,030	24,847,704	8,250,000	5,790,000	749,290	31,695,074	2,165,044	0	29,530,030	24,847,704		
1929	21,829,585	29,530,030	24,847,704	8,250,000	5,790,000	749,290	36,570,325	7,040,295	0	29,530,030	24,847,704		
1930	14,621,041	29,530,030	24,847,704	8,250,000	5,790,000	747,552	29,363,519	0	0	29,363,519	24,707,595		
1931	8,474,134	29,363,519	24,707,595	8,250,000	5,790,000	680,619	23,117,034	0	0	23,117,034	19,451,562	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1932	17,422,187	23,117,034	19,451,562	8,250,000	5,790,000	644,003	25,855,218	0	0	25,855,218	21,755,575		
1933	12,183,500	25,855,218	21,755,575	8,250,000	5,790,000	646,458	23,352,260	0	0	23,352,260	19,649,490		
1934	6,178,192	23,352,260	19,649,490	8,250,000	5,790,000	532,720	14,957,731	0	0	14,957,731	12,586,011		
1935	12,630,349	14,957,731	12,586,011	8,250,000	5,790,000	425,948	13,122,133	0	0	13,122,133	11,041,468	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	13,122,133	11,041,468	8,250,000	5,790,000	408,877	13,322,129	0	0	13,322,129	11,209,752	1953-1977	6,039,013 af/yr
1937	14,306,056	13,322,129	11,209,752	8,250,000	5,790,000	409,467	13,178,718	0	0	13,178,718	11,089,080	1931-1977	6,149,902 af/yr
1938	18,148,319	13,178,718	11,089,080	8,250,000	5,790,000	446,192	16,840,844	0	0	16,840,844	14,170,535	1906-2000	6,281,413 af/yr
1939	11,164,059	16,840,844	14,170,535	8,250,000	5,790,000	448,704	13,515,199	0	0	13,515,199	11,372,209		
1940	9,931,657	13,515,199	11,372,209	8,250,000	5,790,000	368,272	9,038,585	0	0	9,038,585	7,605,413		
1941	20,116,678	9,038,585	7,605,413	8,250,000	5,790,000	380,995	14,734,268	0	0	14,734,268	12,397,980	Flow Adjustments:	
1942	17,225,136	14,734,268	12,397,980	8,250,000	5,790,000	468,792	17,450,612	0	0	17,450,612	14,683,616	1971	203,226 af
1943	13,731,401	17,450,612	14,683,616	8,250,000	5,790,000	488,820	16,653,193	0	0	16,653,193	14,012,637	1972	226,985 af
1944	15,389,422	16,653,193	14,012,637	8,250,000	5,790,000	489,266	17,493,349	0	0	17,493,349	14,719,577	1973	252,377 af
1945	14,140,528	17,493,349	14,719,577	8,250,000	5,790,000	493,929	17,099,948	0	0	17,099,948	14,388,554	1974	196,384 af
1946	11,095,453	17,099,948	14,388,554	8,250,000	5,790,000	454,348	13,701,053	0	0	13,701,053	11,528,593	1975	146,665 af
1947	16,439,486	13,701,053	11,528,593	8,250,000	5,790,000	439,332	15,661,207	0	0	15,661,207	13,177,942	1976	273,250 af
1948	15,139,294	15,661,207	13,177,942	8,250,000	5,790,000	466,396	16,294,105	0	0	16,294,105	13,710,487	1977	112,291 af
1949	16,933,584	16,294,105	13,710,487	8,250,000	5,790,000	498,004	18,689,684	0	0	18,689,684	15,726,220	1978	152,187 af
1950	13,140,416	18,689,684	15,726,220	8,250,000	5,790,000	508,313	17,281,788	0	0	17,281,788	14,541,561	1979	153,559 af
1951	12,505,894	17,281,788	14,541,561	8,250,000	5,790,000	472,674	15,275,008	0	0	15,275,008	12,852,979	1980	161,893 af
1952	20,805,422	15,275,008	12,852,979	8,250,000	5,790,000	516,945	21,523,485	0	0	21,523,485	18,110,689		
1953	11,165,419	21,523,485	18,110,689	8,250,000	5,790,000	546,455	18,102,449	0	0	18,102,449	15,232,098		
1954	8,496,102	18,102,449	15,232,098	8,250,000	5,790,000	448,209	12,110,342	0	0	12,110,342	10,190,108		
1955	9,413,908	12,110,342	10,190,108	8,250,000	5,790,000	333,901	7,150,349	0	0	7,150,349	6,016,579		
1956	11,428,874	7,150,349	6,016,579	8,250,000	5,790,000	252,228	4,284,996	0	0	4,284,996	3,605,560		
1957	21,500,963	4,284,996	3,605,560	8,250,000	5,790,000	297,091	11,448,867	0	0	11,448,867	9,633,517		
1958	15,862,511	11,448,867	9,633,517	8,250,000	5,790,000	386,845	12,884,533	0	0	12,884,533	10,841,542		
1959	9,598,169	12,884,533	10,841,542	8,250,000	5,790,000	351,798	8,090,903	0	0	8,090,903	6,807,998		
1960	11,524,160	8,090,903	6,807,998	8,250,000	5,790,000	272,663	5,302,401	0	0	5,302,401	4,461,644		
1961	10,010,259	5,302,401	4,461,644	8,250,000	5,790,000	199,419	1,073,241	0	0	1,073,241	903,066		
1962	17,377,609	1,073,241	903,066	8,250,000	5,790,000	186,150	4,222,699	0	0	4,222,699	3,553,142		
1963	8,840,900	4,222,699	3,553,142	8,250,000	5,790,000	176,949	-1,153,349	0	1,153,349	0	0		
1964	10,863,586	0	0	8,250,000	5,790,000	132,876	-3,309,290	0	3,309,290	0	0		
1965	19,875,027	0	0	8,250,000	5,790,000	191,775	5,643,252	0	0	5,643,252	4,748,449		
1966	10,679,844	5,643,252	4,748,449	8,250,000	5,790,000	213,377	2,069,719	0	0	2,069,719	1,741,541		
1967	11,670,830	2,069,719	1,741,541	8,250,000	5,790,000	154,478	-453,929	0	453,929	0	0		
1968	13,739,932	0	0	8,250,000	5,790,000	132,876	-432,944	0	432,944	0	0		
1969	15,272,159	0	0	8,250,000	5,790,000	144,231	1,087,928	0	0	1,087,928	915,425		
1970	15,344,136	1,087,928	915,425	8,250,000	5,790,000	167,449	2,224,615	0	0	2,224,615	1,871,877		
1971	15,493,659	2,224,615	1,871,877	8,250,000	5,790,000	192,476	3,485,798	0	0	3,485,798	2,933,084		
1972	13,186,637	3,485,798	2,933,084	8,250,000	5,790,000	194,700	2,437,734	0	0	2,437,734	2,051,203		
1973	18,650,193	2,437,734	2,051,203	8,250,000	5,790,000	229,483	6,818,443	0	0	6,818,443	5,737,301		
1974	13,285,426	6,818,443	5,737,301	8,250,000	5,790,000	264,568	5,799,301	0	0	5,799,301	4,879,755		
1975	17,072,661	5,799,301	4,879,755	8,250,000	5,790,000	282,634	8,549,329	0	0	8,549,329	7,193,734		
1976	11,313,561	8,549,329	7,193,734	8,250,000	5,790,000	279,958	5,542,932	0	0	5			

Upper Basin Yield Mass Balance Analysis

Run 3 - Maintain CRSP Minimum Power Pools, 7.50 maf Lower Basin Delivery, No Shortage

CR Natural Flow at Lee Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables		
1906	18,550,021	29,530,030	24,847,704	7,500,000	6,300,000	749,290	33,530,761	4,000,731	0	29,530,030	24,847,704	Storage	30,167,576 af
1907	21,201,694	29,530,030	24,847,704	7,500,000	6,300,000	749,290	36,182,434	6,652,404	0	29,530,030	24,847,704	Sedimentation Rate (Active)	24,292 af/yr
1908	12,218,817	29,530,030	24,847,704	7,500,000	6,300,000	725,218	27,223,629	0	0	27,223,629	22,907,009	Bank Storage	4%
1909	22,356,301	27,223,629	22,907,009	7,500,000	6,300,000	725,218	35,054,712	5,524,682	0	29,530,030	24,847,704	Adjusted Storage (2060)	29,530,030 af
1910	14,650,616	29,530,030	24,847,704	7,500,000	6,300,000	749,290	29,631,356	101,326	0	29,530,030	24,847,704	UB Demand Level	6,300,000 af/yr
1911	15,499,729	29,530,030	24,847,704	7,500,000	6,300,000	749,290	30,480,469	950,439	0	29,530,030	24,847,704	LB Delivery	7,500,000 af/yr
1912	18,623,410	29,530,030	24,847,704	7,500,000	6,300,000	749,290	33,604,150	4,074,120	0	29,530,030	24,847,704		
1913	14,536,373	29,530,030	24,847,704	7,500,000	6,300,000	749,157	29,517,247	0	0	29,517,247	24,836,947		
1914	21,354,814	29,517,247	24,836,947	7,500,000	6,300,000	749,157	36,322,904	6,792,873	0	29,530,030	24,847,704		
1915	13,623,277	29,530,030	24,847,704	7,500,000	6,300,000	739,725	28,613,582	0	0	28,613,582	24,076,569	Results	
1916	20,142,892	28,613,582	24,076,569	7,500,000	6,300,000	739,725	34,216,749	4,686,719	0	29,530,030	24,847,704	Average CRSP Evap	527,920 af/yr
1917	22,942,804	29,530,030	24,847,704	7,500,000	6,300,000	749,290	37,923,544	8,393,514	0	29,530,030	24,847,704	Total Yield w/ CRSP evap	6,827,920 af/yr
1918	15,865,939	29,530,030	24,847,704	7,500,000	6,300,000	749,290	30,846,679	1,316,649	0	29,530,030	24,847,704		
1919	12,651,369	29,530,030	24,847,704	7,500,000	6,300,000	729,686	27,651,713	0	0	27,651,713	23,267,216	Shortage Years	
1920	22,287,632	27,651,713	23,267,216	7,500,000	6,300,000	729,686	35,409,659	5,879,629	0	29,530,030	24,847,704	Shortage	
1921	22,526,781	29,530,030	24,847,704	7,500,000	6,300,000	749,290	37,507,521	7,977,491	0	29,530,030	24,847,704	1963	0 af
1922	18,447,198	29,530,030	24,847,704	7,500,000	6,300,000	749,290	33,427,938	3,897,908	0	29,530,030	24,847,704	1964	0 af
1923	19,024,046	29,530,030	24,847,704	7,500,000	6,300,000	749,290	34,004,786	4,474,756	0	29,530,030	24,847,704	1967	0 af
1924	13,877,798	29,530,030	24,847,704	7,500,000	6,300,000	742,354	28,865,474	0	0	28,865,474	24,288,521	1968	0 af
1925	14,430,701	28,865,474	24,288,521	7,500,000	6,300,000	734,337	28,761,839	0	0	28,761,839	24,201,318	1968	0 af
1926	15,213,731	28,761,839	24,201,318	7,500,000	6,300,000	740,284	29,435,286	0	0	29,435,286	24,767,982	1977	0 af
1927	19,539,212	29,435,286	24,767,982	7,500,000	6,300,000	748,301	34,216,749	4,896,168	0	29,530,030	24,847,704	NM allocation(w/o evap)	703,125 af/yr
1928	16,954,334	29,530,030	24,847,704	7,500,000	6,300,000	749,290	31,935,074	2,405,044	0	29,530,030	24,847,704		
1929	21,829,585	29,530,030	24,847,704	7,500,000	6,300,000	749,290	36,810,325	7,280,295	0	29,530,030	24,847,704	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1930	14,621,041	29,530,030	24,847,704	7,500,000	6,300,000	749,290	29,601,781	71,751	0	29,530,030	24,847,704		
1931	8,474,134	29,530,030	24,847,704	7,500,000	6,300,000	686,538	23,517,626	0	0	23,517,626	19,788,636		
1932	17,422,187	23,517,626	19,788,636	7,500,000	6,300,000	654,758	26,485,055	0	0	26,485,055	22,285,545		
1933	12,183,500	26,485,055	22,285,545	7,500,000	6,300,000	661,949	24,206,607	0	0	24,206,607	20,368,371		
1934	6,178,192	24,206,607	20,368,371	7,500,000	6,300,000	552,849	18,031,950	0	0	18,031,950	13,489,900		
1935	12,830,349	16,031,950	13,489,900	7,500,000	6,300,000	450,618	14,111,681	0	0	14,111,681	12,126,543	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	14,111,681	12,126,543	7,500,000	6,300,000	437,996	14,822,558	0	0	14,822,558	12,472,271	1953-1977	6,620,057 af/yr
1937	14,306,056	14,822,558	12,472,271	7,500,000	6,300,000	442,943	14,885,671	0	0	14,885,671	12,525,376	1931-1977	13,250 af/yr
1938	18,148,319	14,885,671	12,525,376	7,500,000	6,300,000	483,935	18,750,055	0	0	18,750,055	15,777,018	1906-2000	6,827,920 af/yr
1939	11,164,059	18,750,055	15,777,018	7,500,000	6,300,000	491,625	15,622,489	0	0	15,622,489	13,145,364		
1940	9,931,657	15,622,489	13,145,364	7,500,000	6,300,000	414,284	11,339,862	0	0	11,339,862	9,541,797		
1941	20,116,678	11,339,862	9,541,797	7,500,000	6,300,000	431,015	17,225,525	0	0	17,225,525	14,494,220	Flow Adjustments:	
1942	17,225,136	17,225,525	14,494,220	7,500,000	6,300,000	522,737	20,127,925	0	0	20,127,925	16,936,410	1971	203,226 af
1943	13,731,401	20,127,925	16,936,410	7,500,000	6,300,000	546,608	19,512,717	0	0	19,512,717	16,418,751	1972	226,985 af
1944	15,369,422	19,512,717	16,418,751	7,500,000	6,300,000	550,819	20,531,321	0	0	20,531,321	17,275,843	1973	252,377 af
1945	14,140,528	20,531,321	17,275,843	7,500,000	6,300,000	559,168	20,312,681	0	0	20,312,681	17,091,871	1974	196,384 af
1946	11,095,453	20,312,681	17,091,871	7,500,000	6,300,000	523,198	17,084,936	0	0	17,084,936	14,375,923	1975	246,665 af
1947	16,439,486	17,084,936	14,375,923	7,500,000	6,300,000	511,717	19,212,705	0	0	19,212,705	16,166,309	1976	173,250 af
1948	15,139,294	19,212,705	16,166,309	7,500,000	6,300,000	542,244	20,009,755	0	0	20,009,755	16,836,978	1977	172,291 af
1949	18,933,584	20,009,755	16,836,978	7,500,000	6,300,000	577,243	22,566,096	0	0	22,566,096	18,987,982	1978	152,187 af
1950	13,140,416	22,566,096	18,987,982	7,500,000	6,300,000	590,873	21,315,639	0	0	21,315,639	17,935,799	1979	153,559 af
1951	12,505,894	21,315,639	17,935,799	7,500,000	6,300,000	558,486	19,463,047	0	0	19,463,047	16,376,957	1980	161,893 af
1952	20,805,422	19,463,047	16,376,957	7,500,000	6,300,000	605,942	25,862,527	0	0	25,862,527	21,761,725		
1953	11,165,419	25,862,527	21,761,725	7,500,000	6,300,000	638,572	22,589,374	0	0	22,589,374	19,007,568		
1954	8,496,102	22,589,374	19,007,568	7,500,000	6,300,000	543,381	16,742,094	0	0	16,742,094	14,087,442		
1955	9,413,908	16,742,094	14,087,442	7,500,000	6,300,000	432,065	11,923,937	0	0	11,923,937	10,033,259		
1956	11,426,874	11,923,937	10,033,259	7,500,000	6,300,000	353,322	9,197,489	0	0	9,197,489	7,739,121		
1957	21,500,963	9,197,489	7,739,121	7,500,000	6,300,000	401,055	16,497,397	0	0	16,497,397	13,881,544		
1958	15,862,511	16,497,397	13,881,544	7,500,000	6,300,000	493,620	18,066,288	0	0	18,066,288	15,201,670		
1959	9,598,169	18,066,288	15,201,670	7,500,000	6,300,000	461,325	13,403,132	0	0	13,403,132	11,277,911		
1960	11,524,160	13,403,132	11,277,911	7,500,000	6,300,000	384,885	10,742,407	0	0	10,742,407	9,039,075		
1961	10,010,259	10,742,407	9,039,075	7,500,000	6,300,000	314,281	6,638,386	0	0	6,638,386	5,585,793		
1962	17,377,609	6,638,386	5,585,793	7,500,000	6,300,000	305,597	9,910,398	0	0	9,910,398	8,338,990		
1963	8,840,900	9,910,398	8,338,990	7,500,000	6,300,000	285,014	4,666,284	0	0	4,666,284	3,926,391		
1964	10,863,586	4,666,284	3,926,391	7,500,000	6,300,000	197,571	1,532,299	0	0	1,532,299	1,289,335		
1965	19,875,027	1,532,299	1,289,335	7,500,000	6,300,000	225,909	7,381,417	0	0	7,381,417	6,211,008		
1966	10,679,844	7,381,417	6,211,008	7,500,000	6,300,000	251,764	4,009,497	0	0	4,009,497	3,373,745		
1967	11,670,830	4,009,497	3,373,745	7,500,000	6,300,000	192,341	1,687,966	0	0	1,687,966	1,420,336		
1968	13,739,932	1,687,966	1,420,336	7,500,000	6,300,000	165,754	1,462,164	0	0	1,462,164	1,230,321		
1969	15,272,159	1,462,164	1,230,321	7,500,000	6,300,000	176,916	2,757,407	0	0	2,757,407	2,320,188		
1970	15,344,136	2,757,407	2,320,188	7,500,000	6,300,000	204,417	4,097,125	0	0	4,097,125	3,447,479		
1971	15,493,659	4,097,125	3,447,479	7,500,000	6,300,000	233,638	5,557,146	0	0	5,557,146	4,675,996		
1972	13,186,637	5,557,146	4,675,996	7,500,000	6,300,000	239,970	4,703,812	0	0	4,703,812	3,957,968		
1973	18,650,193	4,703,812	3,957,968	7,500,000	6,300,000	278,776	9,275,229	0	0	9,275,229	7,804,534		
1974	13,285,426	9,275,229	7,804,534	7,500,000	6,300,000	317,801	8,442,854	0	0	8,442,854	7,104,142		
1975	17,072,661	8,442,854	7,104,142	7,500,000	6,300,000	339,725	11,375,790	0	0	11,375,790	9,572,028		
1976	11,313,561	11,375,7											

Upper Basin Yield Mass Balance Analysis

Run 4 - Maintain CRSP Minimum Power Pools, 7.50 maf Lower Basin Delivery, 6% Overall Shortage

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	CRSP Carry-Over Storage	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year-end Storage	Variables	
1906	18,550,021	29,530,030	24,847,704	7,500,000	6,570,000	749,290	33,260,761	3,730,731	0	29,530,030	24,847,704	Storage	30,167,576 af
1907	21,201,694	29,530,030	24,847,704	7,500,000	6,570,000	749,290	35,912,434	6,382,404	0	29,530,030	24,847,704	Sedimentation Rate (Active)	24,292 af/yr
1908	22,218,817	29,530,030	24,847,704	7,500,000	6,570,000	722,429	26,956,418	0	0	26,956,418	22,682,168	Bank Storage	4%
1909	22,356,301	26,956,418	22,682,168	7,500,000	6,570,000	722,429	34,520,290	4,990,260	0	29,530,030	24,847,704	Adjusted Storage (2060)	29,530,030 af
1910	14,650,616	29,530,030	24,847,704	7,500,000	6,570,000	747,548	29,363,098	0	0	29,363,098	24,707,241	UB Demand Level	6,570,000 af/yr
1911	15,499,729	29,363,098	24,707,241	7,500,000	6,570,000	747,548	30,045,280	515,249	0	29,530,030	24,847,704	LB Delivery	7,500,000 af/yr
1912	18,623,410	29,530,030	24,847,704	7,500,000	6,570,000	749,290	33,334,150	3,804,120	0	29,530,030	24,847,704		
1913	14,536,373	29,530,030	24,847,704	7,500,000	6,570,000	746,368	29,250,036	0	0	29,250,036	24,612,106		
1914	21,354,814	29,250,036	24,612,106	7,500,000	6,570,000	746,368	35,788,482	6,258,451	0	29,530,030	24,847,704		
1915	13,623,277	29,530,030	24,847,704	7,500,000	6,570,000	736,936	28,346,371	0	0	28,346,371	23,851,728	Results	
1916	20,142,892	28,346,371	23,851,728	7,500,000	6,570,000	736,936	33,682,327	4,152,296	0	29,530,030	24,847,704	Average CRSP Evap	487,445 af/yr
1917	22,942,804	29,530,030	24,847,704	7,500,000	6,570,000	749,290	37,653,544	8,123,514	0	29,530,030	24,847,704	Total Yield w/ CRSP evap	7,057,445 af/yr
1918	15,865,839	29,530,030	24,847,704	7,500,000	6,570,000	749,290	30,576,679	1,046,649	0	29,530,030	24,847,704		
1919	12,651,369	29,530,030	24,847,704	7,500,000	6,570,000	726,897	27,384,502	0	0	27,384,502	23,042,374	Shortage Years	Shortage
1920	22,287,632	27,384,502	23,042,374	7,500,000	6,570,000	726,897	34,875,237	5,345,207	0	29,530,030	24,847,704		
1921	22,526,781	29,530,030	24,847,704	7,500,000	6,570,000	749,290	37,237,521	7,707,491	0	29,530,030	24,847,704	1963	1,891,395 af
1922	18,447,198	29,530,030	24,847,704	7,500,000	6,570,000	749,290	33,157,938	3,627,908	0	29,530,030	24,847,704	1964	3,339,290 af
1923	19,024,046	29,530,030	24,847,704	7,500,000	6,570,000	749,290	33,734,786	4,204,756	0	29,530,030	24,847,704	1967	542,082 af
1924	13,877,798	29,530,030	24,847,704	7,500,000	6,570,000	739,565	28,598,263	0	0	28,598,263	24,063,679	1968	462,944 af
1925	14,430,701	28,598,263	24,063,679	7,500,000	6,570,000	726,027	28,232,937	0	0	28,232,937	23,756,279	1977	3,385,340 af
1926	15,213,731	28,232,937	23,756,279	7,500,000	6,570,000	726,568	28,650,099	0	0	28,650,099	24,107,296		
1927	19,539,212	28,650,099	24,107,296	7,500,000	6,570,000	740,106	33,379,205	3,849,175	0	29,530,030	24,847,704	NM allocation(w/o evap)	733,500 af/yr
1928	16,954,334	29,530,030	24,847,704	7,500,000	6,570,000	749,290	31,665,074	2,135,044	0	29,530,030	24,847,704		
1929	21,829,585	29,530,030	24,847,704	7,500,000	6,570,000	749,290	36,540,325	7,010,295	0	29,530,030	24,847,704		
1930	14,621,041	29,530,030	24,847,704	7,500,000	6,570,000	747,242	29,333,829	0	0	29,333,829	24,682,613	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1931	8,474,134	29,333,829	24,682,613	7,500,000	6,570,000	679,696	23,058,267	0	0	23,058,267	19,402,113		
1932	17,422,187	23,058,267	19,402,113	7,500,000	6,570,000	642,479	25,767,975	0	0	25,767,975	21,682,166		
1933	12,183,500	25,767,975	21,682,166	7,500,000	6,570,000	644,346	23,237,129	0	0	23,237,129	19,552,614		
1934	6,178,192	23,237,129	19,552,614	7,500,000	6,570,000	530,032	14,815,289	0	0	14,815,289	12,466,154		
1935	12,830,349	14,815,289	12,466,154	7,500,000	6,570,000	422,895	12,952,943	0	0	12,952,943	10,899,105	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	12,952,943	10,899,105	7,500,000	6,570,000	405,072	13,126,744	0	0	13,126,744	11,045,348	1953-1977	6,812,490 af/yr
1937	14,306,056	13,126,744	11,045,348	7,500,000	6,570,000	405,121	12,957,679	0	0	12,957,679	10,903,090	1931-1977	152,187 af
1938	18,148,319	12,957,679	10,903,090	7,500,000	6,570,000	441,316	16,594,682	0	0	16,594,682	13,963,404	1906-2000	7,057,445 af/yr
1939	11,164,059	16,594,682	13,963,404	7,500,000	6,570,000	444,309	13,244,432	0	0	13,244,432	11,144,375		
1940	9,931,657	13,244,432	11,144,375	7,500,000	6,570,000	362,368	8,743,721	0	0	8,743,721	7,357,303		
1941	20,116,678	8,743,721	7,357,303	7,500,000	6,570,000	374,594	14,415,805	0	0	14,415,805	12,130,013	Flow Adjustments:	
1942	17,225,136	14,415,805	12,130,013	7,500,000	6,570,000	461,903	17,109,038	0	0	17,109,038	14,396,203	1971	203,226 af
1943	13,731,401	17,109,038	14,396,203	7,500,000	6,570,000	481,454	16,288,986	0	0	16,288,986	13,706,179	1972	226,985 af
1944	15,369,422	16,288,986	13,706,179	7,500,000	6,570,000	481,432	17,106,976	0	0	17,106,976	14,394,468	1973	252,377 af
1945	14,140,528	17,106,976	14,394,468	7,500,000	6,570,000	485,637	16,691,867	0	0	16,691,867	14,045,179	1974	196,384 af
1946	11,095,453	16,691,867	14,045,179	7,500,000	6,570,000	445,808	13,271,712	0	0	13,271,712	11,167,329	1975	246,665 af
1947	16,439,486	13,271,712	11,167,329	7,500,000	6,570,000	430,153	15,211,045	0	0	15,211,045	12,799,159	1976	173,250 af
1948	15,139,294	15,211,045	12,799,159	7,500,000	6,570,000	456,786	15,823,553	0	0	15,823,553	13,314,546	1977	112,291 af
1949	16,933,584	15,823,553	13,314,546	7,500,000	6,570,000	467,974	18,199,163	0	0	18,199,163	15,313,476	1978	152,893 af
1950	13,140,416	18,199,163	15,314,546	7,500,000	6,570,000	497,870	16,771,709	0	0	16,771,709	14,112,362	1979	153,595 af
1951	12,505,894	16,771,709	14,112,362	7,500,000	6,570,000	461,826	14,745,777	0	0	14,745,777	12,407,664	1980	161,893 af
1952	20,805,422	14,745,777	12,407,664	7,500,000	6,570,000	505,702	20,975,497	0	0	20,975,497	17,649,591		
1953	11,165,419	20,975,497	17,649,591	7,500,000	6,570,000	534,824	17,536,092	0	0	17,536,092	14,755,543		
1954	8,496,102	17,536,092	14,755,543	7,500,000	6,570,000	436,199	11,525,995	0	0	11,525,995	9,698,416		
1955	9,413,908	11,525,995	9,698,416	7,500,000	6,570,000	321,520	6,548,383	0	0	6,548,383	5,510,062		
1956	11,426,874	6,548,383	5,510,062	7,500,000	6,570,000	239,482	3,665,775	0	0	3,665,775	3,084,525		
1957	21,500,963	3,665,775	3,084,525	7,500,000	6,570,000	283,989	10,812,749	0	0	10,812,749	9,098,263		
1958	15,862,511	10,812,749	9,098,263	7,500,000	6,570,000	373,394	12,231,866	0	0	12,231,866	10,292,363		
1959	9,598,169	12,231,866	10,292,363	7,500,000	6,570,000	338,005	7,422,030	0	0	7,422,030	6,245,191		
1960	11,524,160	7,422,030	6,245,191	7,500,000	6,570,000	258,535	4,617,655	0	0	4,617,655	3,885,472		
1961	10,010,259	4,617,655	3,885,472	7,500,000	6,570,000	184,963	372,950	0	0	372,950	313,815		
1962	17,377,609	372,950	313,815	7,500,000	6,570,000	173,373	3,507,186	0	0	3,507,186	2,951,081		
1963	8,840,900	3,507,186	2,951,081	7,500,000	6,570,000	169,481	-1,891,395	0	1,891,395	0	0		
1964	10,863,586	0	0	7,500,000	6,570,000	132,876	-3,339,290	0	3,339,290	0	0		
1965	19,875,027	0	0	7,500,000	6,570,000	191,465	5,613,562	0	0	5,613,562	4,723,467		
1966	10,679,844	5,613,562	4,723,467	7,500,000	6,570,000	212,454	2,010,952	0	0	2,010,952	1,692,093		
1967	11,670,830	2,010,952	1,692,093	7,500,000	6,570,000	153,864	-542,082	0	542,082	0	0		
1968	13,739,932	0	0	7,500,000	6,570,000	132,876	-462,944	0	462,944	0	0		
1969	15,272,159	0	0	7,500,000	6,570,000	143,921	1,058,238	0	0	1,058,238	890,442		
1970	15,344,136	1,058,238	890,442	7,500,000	6,570,000	166,526	2,185,848	0	0	2,185,848	1,822,428		
1971	15,493,659	2,185,848	1,822,428	7,500,000	6,570,000	190,952	3,398,555	0	0	3,398,555	2,859,675		
1972	13,186,637	3,398,555	2,859,675	7,500,000	6,570,000	192,588	2,322,603	0	0	2,322,603	1,954,327		
1973	18,650,193	2,322,603	1,954,327	7,500,000	6,570,000	226,795	6,676,001	0	0	6,676,001	5,617,444		
1974	13,285,426	6,676,001	5,617,444	7,500,000	6,570,000	261,316	5,630,111	0	0	5,630,111	4,737,392		
1975	17,072,681	5,630,111	4,737,392	7,500,000	6,570,000	278,829	8,353,944	0	0	8,353,944	7,029,330		
1976	11,313,561	8,353,944	7,029,330	7,500,000	6,570,000	275,612	5,321,894	0	0	5,321,894	4,478,046		
1977	5,551,188	5,321,894	4,478										

Upper Basin Yield Mass Balance Analysis

Run 5 - Use CRSP Minimum Power Pools, 8.25 maf Lower Basin Delivery, No Shortage

CR Natural Flow at Lee Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables		
CY													
1906	18,550,021	33,833,590	29,151,263	8,250,000	5,720,000	725,390	37,688,221	3,854,631	0	33,833,590	29,151,263	Storage	35,233,298 af
1907	21,201,894	33,833,590	29,151,263	8,250,000	5,720,000	725,390	40,339,894	6,506,304	0	33,833,590	29,151,263	Sedimentation Rate (Active)	37,000 af/yr
1908	12,218,817	33,833,590	29,151,263	8,250,000	5,720,000	699,302	31,383,105	0	0	33,833,590	27,039,907	Bank Storage	4%
1909	22,356,301	33,833,590	27,039,907	8,250,000	5,720,000	699,302	39,070,194	5,236,514	0	33,833,590	29,151,263	Adjusted Storage (2060)	33,833,590 af
1910	14,650,616	33,833,590	29,151,263	8,250,000	5,720,000	724,918	33,789,288	0	0	33,833,590	29,151,263	UB Demand Level	5,720,000 af/yr
1911	15,499,729	33,833,590	29,151,263	8,250,000	5,720,000	724,918	34,594,099	760,509	0	33,833,590	29,151,263	LB Delivery	8,250,000 af/yr
1912	18,623,410	33,833,590	29,151,263	8,250,000	5,720,000	725,390	37,761,810	3,928,020	0	33,833,590	29,151,263		
1913	14,536,373	33,833,590	29,151,263	8,250,000	5,720,000	723,715	33,676,248	0	0	33,833,590	29,151,263		
1914	21,354,814	33,833,590	29,151,263	8,250,000	5,720,000	723,715	40,337,348	6,503,758	0	33,833,590	29,151,263		
1915	13,623,277	33,833,590	29,151,263	8,250,000	5,720,000	714,096	32,772,771	0	0	33,833,590	28,237,254		
1916	20,142,892	33,833,590	28,237,254	8,250,000	5,720,000	714,096	38,231,566	4,397,976	0	33,833,590	29,151,263		
1917	22,942,804	33,833,590	29,151,263	8,250,000	5,720,000	725,390	42,981,704	8,247,414	0	33,833,590	29,151,263	Average CRSP Evap	463,436 af/yr
1918	15,865,939	33,833,590	29,151,263	8,250,000	5,720,000	725,390	35,004,139	1,170,549	0	33,833,590	29,151,263	Total Yield w/ CRSP evap	6,183,436 af/yr
1919	12,651,369	33,833,590	29,151,263	8,250,000	5,720,000	703,858	31,811,100	0	0	33,833,590	27,408,672		
1920	22,287,632	33,833,590	27,408,672	8,250,000	5,720,000	703,858	39,424,874	5,591,284	0	33,833,590	29,151,263		
1921	22,526,781	33,833,590	29,151,263	8,250,000	5,720,000	725,390	41,664,981	7,831,391	0	33,833,590	29,151,263		
1922	18,447,198	33,833,590	29,151,263	8,250,000	5,720,000	725,390	37,585,399	3,751,088	0	33,833,590	29,151,263		
1923	19,024,046	33,833,590	29,151,263	8,250,000	5,720,000	725,390	38,162,246	4,328,658	0	33,833,590	29,151,263		
1924	13,877,798	33,833,590	29,151,263	8,250,000	5,720,000	716,777	33,024,611	0	0	33,833,590	28,454,241		
1925	14,430,701	33,833,590	28,454,241	8,250,000	5,720,000	705,558	32,779,753	0	0	32,779,753	28,243,270		
1926	15,213,731	33,833,590	28,243,270	8,250,000	5,720,000	708,648	33,314,836	0	0	33,314,836	28,704,301		
1927	19,539,212	33,833,590	28,704,301	8,250,000	5,720,000	719,867	38,164,181	4,330,591	0	33,833,590	29,151,263	NM allocation (w/o evap)	637,875 af/yr
1928	16,954,334	33,833,590	29,151,263	8,250,000	5,720,000	725,390	36,092,534	2,258,944	0	33,833,590	29,151,263		
1929	21,829,585	33,833,590	29,151,263	8,250,000	5,720,000	725,390	40,967,785	7,134,195	0	33,833,590	29,151,263		
1930	14,621,041	33,833,590	29,151,263	8,250,000	5,720,000	724,606	33,760,025	0	0	33,760,025	29,087,879		
1931	8,474,134	33,760,025	29,087,879	8,250,000	5,720,000	658,307	27,605,852	0	0	27,605,852	23,785,399	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1932	17,422,187	27,605,852	23,785,399	8,250,000	5,720,000	622,911	30,435,128	0	0	30,435,128	26,223,124		
1933	12,183,500	30,435,128	26,223,124	8,250,000	5,720,000	627,333	28,021,294	0	0	28,021,294	24,143,347		
1934	8,178,192	28,021,294	24,143,347	8,250,000	5,720,000	513,222	19,716,264	0	0	19,716,264	16,987,674		
1935	12,630,349	19,716,264	16,987,674	8,250,000	5,720,000	406,222	17,170,391	0	0	17,170,391	15,483,417	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	17,170,391	15,483,417	8,250,000	5,720,000	390,704	18,258,560	0	0	18,258,560	15,731,706	1953-1977	5,934,611 af/yr
1937	14,306,056	18,258,560	15,731,706	8,250,000	5,720,000	393,164	18,201,452	0	0	18,201,452	15,682,501	1931-1977	6,058,021 af/yr
1938	18,148,319	18,201,452	15,682,501	8,250,000	5,720,000	432,434	21,947,337	0	0	21,947,337	18,909,983	1906-2000	6,183,436 af/yr
1939	11,164,059	21,947,337	18,909,983	8,250,000	5,720,000	437,780	18,703,617	0	0	18,703,617	16,115,170		
1940	9,931,657	18,703,617	16,115,170	8,250,000	5,720,000	356,461	14,308,812	0	0	14,308,812	12,328,575		
1941	20,116,678	14,308,812	12,328,575	8,250,000	5,720,000	371,160	20,084,330	0	0	20,084,330	17,304,802	Flow Adjustments:	
1942	17,225,136	20,084,330	17,304,802	8,250,000	5,720,000	462,377	22,877,090	0	0	22,877,090	19,711,064	1971	203,226 af
1943	13,731,401	22,877,090	19,711,064	8,250,000	5,720,000	484,411	22,154,080	0	0	22,154,080	19,088,114	1972	226,985 af
1944	15,369,422	22,154,080	19,088,114	8,250,000	5,720,000	486,433	23,067,069	0	0	23,067,069	19,874,751	1973	252,377 af
1945	14,140,528	23,067,069	19,874,751	8,250,000	5,720,000	492,723	22,744,874	0	0	22,744,874	19,597,146	1974	196,384 af
1946	11,095,453	22,744,874	19,597,146	8,250,000	5,720,000	453,859	19,416,468	0	0	19,416,468	16,729,368	1975	246,665 af
1947	16,439,486	19,416,468	16,729,368	8,250,000	5,720,000	440,031	21,445,923	0	0	21,445,923	18,477,961	1976	173,250 af
1948	15,139,294	21,445,923	18,477,961	8,250,000	5,720,000	468,090	22,148,127	0	0	22,148,127	19,081,262	1977	112,291 af
1949	16,933,584	22,148,127	19,081,262	8,250,000	5,720,000	502,742	24,606,969	0	0	24,606,969	21,201,541	1978	152,187 af
1950	13,140,416	24,606,969	21,201,541	8,250,000	5,720,000	514,629	23,262,756	0	0	23,262,756	20,043,357	1979	153,559 af
1951	12,505,894	23,262,756	20,043,357	8,250,000	5,720,000	479,627	21,319,023	0	0	21,319,023	18,368,623	1980	161,893 af
1952	20,805,422	21,319,023	18,368,623	8,250,000	5,720,000	526,102	27,628,343	0	0	27,628,343	23,804,778		
1953	11,165,419	27,628,343	23,804,778	8,250,000	5,720,000	557,478	24,266,285	0	0	24,266,285	20,908,004		
1954	8,496,102	24,266,285	20,908,004	8,250,000	5,720,000	458,530	18,333,856	0	0	18,333,856	15,796,582		
1955	9,413,908	18,333,856	15,796,582	8,250,000	5,720,000	343,218	13,434,547	0	0	13,434,547	11,575,301		
1956	11,426,874	13,434,547	11,575,301	8,250,000	5,720,000	261,206	10,630,214	0	0	10,630,214	9,159,069		
1957	21,500,963	10,630,214	9,159,069	8,250,000	5,720,000	306,243	17,852,934	0	0	17,852,934	15,382,216		
1958	15,862,511	17,852,934	15,382,216	8,250,000	5,720,000	401,013	19,344,432	0	0	19,344,432	16,667,301		
1959	9,598,169	19,344,432	16,667,301	8,250,000	5,720,000	365,449	14,806,152	0	0	14,806,152	12,584,765		
1960	11,524,160	14,806,152	12,584,765	8,250,000	5,720,000	286,914	11,873,398	0	0	11,873,398	10,230,205		
1961	10,010,259	11,873,398	10,230,205	8,250,000	5,720,000	213,385	7,700,263	0	0	7,700,263	6,634,601		
1962	17,377,609	7,700,263	6,634,601	8,250,000	5,720,000	203,083	10,904,789	0	0	10,904,789	9,395,644		
1963	8,840,900	10,904,789	9,395,644	8,250,000	5,720,000	180,671	5,595,018	0	0	5,595,018	4,820,707		
1964	10,863,586	5,595,018	4,820,707	8,250,000	5,720,000	90,114	2,398,489	0	0	2,398,489	2,066,556		
1965	19,875,027	2,398,489	2,066,556	8,250,000	5,720,000	117,696	8,185,821	0	0	8,185,821	7,052,962		
1966	10,679,844	8,185,821	7,052,962	8,250,000	5,720,000	142,760	4,752,904	0	0	4,752,904	4,095,136		
1967	11,670,830	4,752,904	4,095,136	8,250,000	5,720,000	80,877	2,372,858	0	0	2,372,858	2,044,471		
1968	13,739,932	2,372,858	2,044,471	8,250,000	5,720,000	52,531	2,090,259	0	0	2,090,259	1,800,982		
1969	15,272,159	2,090,259	1,800,982	8,250,000	5,720,000	62,717	3,329,701	0	0	3,329,701	2,868,894		
1970	15,344,136	3,329,701	2,868,894	8,250,000	5,720,000	89,587	4,614,250	0	0	4,614,250	3,975,671		
1971	15,493,659	4,614,250	3,975,671	8,250,000	5,720,000	118,224	6,019,685	0	0	6,019,685	5,186,604		
1972	13,186,637	6,019,685	5,186,604	8,250,000	5,720,000	123,531	5,112,790	0	0	5,112,790	4,405,217		
1973	18,650,193	5,112,790	4,405,217	8,250,000	5,720,000	181,977	9,631,006	0	0	9,631,006	8,298,144		
1974	13,285,426	9,631,006	8,298,144	8,250,000	5,720,000	200,653	8,745,780	0	0	8,745,780	7,535,427		
1975	17,072,661	8,745,780	7,535,427	8,250,000	5,720,000	221,897	11,626,544	0	0	11,626,544	10,017,513		
1976	11,313,561												

Upper Basin Yield Mass Balance Analysis

Run 6 - Use CRSP Minimum Power Pools, 8.25 maf Lower Basin Delivery, 6% Overall Shortage

CR Natural Flow at Lee Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables		
1906	18,550,021	33,833,590	29,151,263	8,250,000	5,980,000	725,390	37,428,221	3,594,631	0	33,833,590	29,151,263	Storage	35,233,298 af
1907	21,201,694	33,833,590	29,151,263	8,250,000	5,980,000	725,390	40,079,894	6,246,304	0	33,833,590	29,151,263	Sedimentation Rate (Active)	37,000 af/yr
1908	12,218,817	33,833,590	29,151,263	8,250,000	5,980,000	696,563	31,125,844	0	0	31,125,844	26,818,249	Bank Storage	4%
1909	22,356,301	31,125,844	26,818,249	8,250,000	5,980,000	696,563	38,555,581	4,721,991	0	33,833,590	29,151,263	Adjusted Storage (2060)	33,833,590 af
1910	14,650,616	33,833,590	29,151,263	8,250,000	5,980,000	722,179	33,532,027	0	0	33,532,027	28,891,434	UB Demand Level	5,980,000 af/yr
1911	15,499,729	33,532,027	28,891,434	8,250,000	5,980,000	722,179	34,079,577	245,987	0	33,833,590	29,151,263	LB Delivery	8,250,000 af/yr
1912	18,623,410	33,833,590	29,151,263	8,250,000	5,980,000	725,390	37,501,610	3,668,020	0	33,833,590	29,151,263		
1913	14,536,373	33,833,590	29,151,263	8,250,000	5,980,000	720,976	33,418,987	0	0	33,418,987	28,794,038		
1914	21,354,814	33,418,987	28,794,038	8,250,000	5,980,000	720,976	39,822,825	5,989,235	0	33,833,590	29,151,263		
1915	13,623,277	33,833,590	29,151,263	8,250,000	5,980,000	711,358	32,515,509	0	0	32,515,509	28,015,595		
1916	20,142,892	32,515,509	28,015,595	8,250,000	5,980,000	711,358	37,717,044	3,883,454	0	33,833,590	29,151,263		
1917	22,942,804	33,833,590	29,151,263	8,250,000	5,980,000	725,390	41,821,004	7,987,414	0	33,833,590	29,151,263		
1918	15,865,939	33,833,590	29,151,263	8,250,000	5,980,000	725,390	34,744,139	910,549	0	33,833,590	29,151,263		
1919	12,651,369	33,833,590	29,151,263	8,250,000	5,980,000	701,120	31,553,839	0	0	31,553,839	27,187,013		
1920	22,287,632	31,553,839	27,187,013	8,250,000	5,980,000	701,120	38,910,351	5,076,782	0	33,833,590	29,151,263		
1921	22,526,781	33,833,590	29,151,263	8,250,000	5,980,000	725,390	41,404,981	7,571,391	0	33,833,590	29,151,263	1963	703,237 af
1922	18,447,198	33,833,590	29,151,263	8,250,000	5,980,000	725,390	37,325,398	3,491,808	0	33,833,590	29,151,263	1964	3,371,431 af
1923	19,024,046	33,833,590	29,151,263	8,250,000	5,980,000	725,390	37,902,246	4,068,656	0	33,833,590	29,151,263	1967	639,589 af
1924	13,877,998	33,833,590	29,151,263	8,250,000	5,980,000	714,039	32,767,349	0	0	32,767,349	28,232,583	1968	495,085 af
1925	14,430,701	32,767,349	28,232,583	8,250,000	5,980,000	697,400	32,270,651	0	0	32,270,651	27,804,623	1968	3,665,093 af
1926	15,213,731	32,270,651	27,804,623	8,250,000	5,980,000	695,184	32,559,198	0	0	32,559,198	28,053,238		
1927	19,539,212	32,559,198	28,053,238	8,250,000	5,980,000	711,823	37,166,987	3,322,997	0	33,833,590	29,151,263	NM allocation (w/o evap)	667,125 af/yr
1928	16,954,334	33,833,590	29,151,263	8,250,000	5,980,000	725,390	35,832,534	1,998,944	0	33,833,590	29,151,263		
1929	21,829,585	33,833,590	29,151,263	8,250,000	5,980,000	725,390	40,707,786	6,874,195	0	33,833,590	29,151,263		
1930	14,621,041	33,833,590	29,151,263	8,250,000	5,980,000	721,868	33,502,763	0	0	33,502,763	28,866,220		
1931	8,474,134	33,502,763	28,866,220	8,250,000	5,980,000	650,148	27,096,749	0	0	27,096,749	23,346,753		
1932	17,422,187	27,096,749	23,346,753	8,250,000	5,980,000	609,447	29,679,489	0	0	29,679,489	25,572,060		
1933	12,183,500	29,679,489	25,572,060	8,250,000	5,980,000	608,675	27,024,314	0	0	27,024,314	23,284,342		
1934	6,178,192	27,024,314	23,284,342	8,250,000	5,980,000	489,480	18,483,026	0	0	18,483,026	15,925,107		
1935	12,630,349	18,483,026	15,925,107	8,250,000	5,980,000	377,502	16,505,872	0	0	16,505,872	14,221,578		
1936	14,648,873	16,505,872	14,221,578	8,250,000	5,980,000	357,112	16,567,834	0	0	16,567,834	14,274,792		
1937	14,306,056	16,567,834	14,274,792	8,250,000	5,980,000	354,802	16,288,888	0	0	16,288,888	14,034,623		
1938	18,148,319	16,288,888	14,034,623	8,250,000	5,980,000	389,402	19,817,805	0	0	19,817,805	17,075,162		
1939	11,164,059	19,817,805	17,075,162	8,250,000	5,980,000	390,177	16,361,687	0	0	16,361,687	14,097,346		
1940	9,931,657	16,361,687	14,097,346	8,250,000	5,980,000	304,384	11,758,959	0	0	11,758,959	10,131,603		
1941	20,116,678	11,758,959	10,131,603	8,250,000	5,980,000	314,703	17,330,935	0	0	17,330,935	14,932,457		
1942	17,225,138	17,330,935	14,932,457	8,250,000	5,980,000	401,631	19,924,440	0	0	19,924,440	17,167,040		
1943	13,731,401	19,924,440	17,167,040	8,250,000	5,980,000	419,467	19,006,373	0	0	19,006,373	16,376,027		
1944	15,369,422	19,006,373	16,376,027	8,250,000	5,980,000	417,381	19,728,415	0	0	19,728,415	16,998,143		
1945	14,140,528	19,728,415	16,998,143	8,250,000	5,980,000	419,647	19,219,295	0	0	19,219,295	16,559,482		
1946	11,095,453	19,219,295	16,559,482	8,250,000	5,980,000	376,846	15,707,903	0	0	15,707,903	13,534,041		
1947	16,439,486	15,707,903	13,534,041	8,250,000	5,980,000	359,162	17,558,227	0	0	17,558,227	15,128,294		
1948	15,139,294	17,558,227	15,128,294	8,250,000	5,980,000	384,448	18,083,073	0	0	18,083,073	15,580,505		
1949	16,933,584	18,083,073	15,580,505	8,250,000	5,980,000	414,405	20,372,251	0	0	20,372,251	17,552,877		
1950	13,140,416	20,372,251	17,552,877	8,250,000	5,980,000	422,676	18,859,991	0	0	18,859,991	16,249,903		
1951	12,505,894	18,859,991	16,249,903	8,250,000	5,980,000	384,133	16,751,752	0	0	16,751,752	14,433,429		
1952	20,805,422	16,751,752	14,433,429	8,250,000	5,980,000	427,143	22,900,031	0	0	22,900,031	19,730,831		
1953	11,165,419	22,900,031	19,730,831	8,250,000	5,980,000	455,126	19,380,324	0	0	19,380,324	16,698,226		
1954	8,496,102	19,380,324	16,698,226	8,250,000	5,980,000	352,857	13,293,589	0	0	13,293,589	11,453,834		
1955	9,413,908	13,293,589	11,453,834	8,250,000	5,980,000	234,293	8,243,183	0	0	8,243,183	7,102,386		
1956	11,426,874	8,243,183	7,102,386	8,250,000	5,980,000	149,099	5,290,958	0	0	5,290,958	4,558,728		
1957	21,500,963	5,290,958	4,558,728	8,250,000	5,980,000	193,021	12,368,901	0	0	12,368,901	10,657,133		
1958	15,862,511	12,368,901	10,657,133	8,250,000	5,980,000	282,741	13,718,671	0	0	13,718,671	11,820,105		
1959	9,598,169	13,718,671	11,820,105	8,250,000	5,980,000	245,190	8,841,650	0	0	8,841,650	7,618,029		
1960	11,524,160	8,841,650	7,618,029	8,250,000	5,980,000	162,732	5,973,078	0	0	5,973,078	5,146,447		
1961	10,010,259	5,973,078	5,146,447	8,250,000	5,980,000	86,352	1,666,985	0	0	1,666,985	1,436,286		
1962	17,377,609	1,666,985	1,436,286	8,250,000	5,980,000	73,239	4,741,355	0	0	4,741,355	4,085,186		
1963	8,540,900	4,741,355	4,085,186	8,250,000	5,980,000	55,493	-703,237	0	0	-703,237	0		
1964	10,863,586	0	0	8,250,000	5,980,000	5,017	-3,371,431	0	0	-3,371,431	0		
1965	19,875,027	0	0	8,250,000	5,980,000	84,427	5,580,600	0	0	5,580,600	4,808,285		
1966	10,679,844	5,580,600	4,808,285	8,250,000	5,980,000	85,136	1,945,307	0	0	1,945,307	1,676,091		
1967	11,670,830	1,945,307	1,676,091	8,250,000	5,980,000	25,726	-639,589	0	0	-639,589	0		
1968	13,739,932	0	0	8,250,000	5,980,000	5,017	-495,085	0	0	-495,085	0		
1969	15,272,159	0	0	8,250,000	5,980,000	15,942	1,026,217	0	0	1,026,217	884,196		
1970	15,344,136	1,026,217	884,196	8,250,000	5,980,000	38,320	2,102,033	0	0	2,102,033	1,811,127		
1971	15,493,659	2,102,033	1,811,127	8,250,000	5,980,000	62,559	3,303,132	0	0	3,303,132	2,846,003		
1972	13,186,637	3,303,132	2,846,003	8,250,000	5,980,000	63,562	2,196,207	0	0	2,196,207	1,892,268		
1973	16,650,193	2,196,207	1,892,268	8,250,000	5,980,000	97,793	6,518,607	0	0	6,518,607	5,616,478		
1974	13,285,426	6,518,607	5,616,478	8,250,000	5,980,000	132,344	5,441,689	0	0	5,441,689	4,688,598		
1975	17,072,661	5,441,689	4,688,598	8,250,000	5,980,000	149,550	8,134,800	0	0	8,134,800	7,009,002		
1976	11,313,561	8,134,800	7,009,002	8,250,000	5,980,000	145,622	5,072,739	0	0	5,072,739	4,370,709		
1977	5,551,188	5,072,739	4,370,709	8,250,000	5,980,000	59,020	-3,665,093	0	0	-3,665,093	0		
1978	15,335,909	0	0	8,250,000	5,980,000	16,613	1,089,295	0	0	1,089,295	938,544		
1979	17,82												

Upper Basin Yield Mass Balance Analysis

Run 7 - Use CRSP Minimum Power Pools, 7.50 maf Lower Basin Delivery, No Shortage

CY	CR Natural Flow at Lae Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables	
1906	18,550,021	33,833,590	29,151,263	7,500,000	6,470,000	725,390	37,688,221	3,854,631	0	33,833,590	29,151,263	Storage	35,233,298 af
1907	21,201,694	33,833,590	29,151,263	7,500,000	6,470,000	725,390	40,339,894	6,506,304	0	33,833,590	29,151,263	Sedimentation Rate (Active)	37,000 af/yr
1908	12,218,617	33,833,590	29,151,263	7,500,000	6,470,000	699,302	31,383,105	0	0	31,383,105	27,039,907	Bank Storage	4%
1909	22,356,301	33,833,590	29,151,263	7,500,000	6,470,000	699,302	39,070,104	5,236,514	0	33,833,590	29,151,263	Adjusted Storage (2060)	33,833,590 af
1910	14,650,616	33,833,590	29,151,263	7,500,000	6,470,000	724,918	34,594,099	0	0	33,833,590	29,151,263	UB Demand Level	6,470,000 af/yr
1911	15,499,729	33,833,590	29,151,263	7,500,000	6,470,000	724,918	33,789,288	0	0	33,833,590	29,151,263	LB Delivery	7,500,000 af/yr
1912	18,623,410	33,833,590	29,151,263	7,500,000	6,470,000	725,390	37,761,610	3,928,020	0	33,833,590	29,151,263		
1913	14,536,373	33,833,590	29,151,263	7,500,000	6,470,000	723,715	40,337,348	0	0	33,833,590	29,151,263		
1914	21,354,814	33,833,590	29,151,263	7,500,000	6,470,000	723,715	40,337,348	6,503,758	0	33,833,590	29,151,263		
1915	13,623,277	33,833,590	29,151,263	7,500,000	6,470,000	714,096	32,772,771	0	0	32,772,771	28,237,254		
1916	20,142,892	32,772,771	28,237,254	7,500,000	6,470,000	714,096	38,231,566	4,397,976	0	33,833,590	29,151,263	Results	
1917	22,942,804	33,833,590	29,151,263	7,500,000	6,470,000	725,390	42,081,004	8,247,414	0	33,833,590	29,151,263	Average CRSP Evap	463,436 af/yr
1918	15,865,939	33,833,590	29,151,263	7,500,000	6,470,000	725,390	35,004,139	1,170,549	0	33,833,590	29,151,263	Total Yield w/ CRSP evap	6,933,436 af/yr
1919	12,851,369	33,833,590	29,151,263	7,500,000	6,470,000	703,858	31,811,100	0	0	31,811,100	27,408,672		
1920	22,287,632	31,811,100	27,408,672	7,500,000	6,470,000	703,858	39,424,874	5,591,284	0	33,833,590	29,151,263	Shortage Years	Shortage
1921	22,528,781	33,833,590	29,151,263	7,500,000	6,470,000	725,390	41,664,981	7,831,391	0	33,833,590	29,151,263	1963	0 af
1922	18,447,198	33,833,590	29,151,263	7,500,000	6,470,000	725,390	37,585,398	3,751,808	0	33,833,590	29,151,263	1964	0 af
1923	19,024,046	33,833,590	29,151,263	7,500,000	6,470,000	725,390	38,162,246	4,328,656	0	33,833,590	29,151,263	1967	0 af
1924	13,877,798	33,833,590	29,151,263	7,500,000	6,470,000	716,777	33,024,611	0	0	33,024,611	28,454,241	1968	0 af
1925	14,430,701	33,024,611	28,454,241	7,500,000	6,470,000	705,558	32,779,753	0	0	32,779,753	28,243,270	1977	0 af
1926	15,213,731	32,779,753	28,243,270	7,500,000	6,470,000	708,648	33,314,836	0	0	33,314,836	28,704,301		
1927	19,539,212	33,314,836	28,704,301	7,500,000	6,470,000	719,867	38,164,181	4,330,591	0	33,833,590	29,151,263	NM allocation (w/o evap)	722,250 af/yr
1928	16,954,334	33,833,590	29,151,263	7,500,000	6,470,000	725,390	38,092,534	2,258,944	0	33,833,590	29,151,263		
1929	21,829,585	33,833,590	29,151,263	7,500,000	6,470,000	725,390	40,967,785	7,134,195	0	33,833,590	29,151,263		
1930	14,621,041	33,833,590	29,151,263	7,500,000	6,470,000	724,606	33,760,025	0	0	33,760,025	29,087,879	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1931	8,474,134	33,760,025	29,087,879	7,500,000	6,470,000	658,307	27,605,852	0	0	27,605,852	23,785,399		
1932	17,422,187	27,605,852	23,785,399	7,500,000	6,470,000	622,911	30,435,128	0	0	30,435,128	26,223,124		
1933	12,183,500	30,435,128	26,223,124	7,500,000	6,470,000	627,333	28,021,294	0	0	28,021,294	24,143,347		
1934	6,178,192	28,021,294	24,143,347	7,500,000	6,470,000	513,222	19,716,264	0	0	19,716,264	16,987,874		
1935	12,630,349	19,716,264	16,987,874	7,500,000	6,470,000	406,222	17,970,391	0	0	17,970,391	15,483,417	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	17,970,391	15,483,417	7,500,000	6,470,000	390,704	18,258,560	0	0	18,258,560	15,731,706	1953-1977	6,684,611 af/yr
1937	14,306,056	18,258,560	15,731,706	7,500,000	6,470,000	393,164	18,201,452	0	0	18,201,452	15,682,501	1931-1977	6,808,021 af/yr
1938	18,148,319	18,201,452	15,682,501	7,500,000	6,470,000	432,434	21,947,337	0	0	21,947,337	18,909,983	1906-2000	6,933,436 af/yr
1939	11,164,059	21,947,337	18,909,983	7,500,000	6,470,000	437,780	18,703,617	0	0	18,703,617	16,115,170		
1940	9,931,657	18,703,617	16,115,170	7,500,000	6,470,000	356,461	14,308,812	0	0	14,308,812	12,328,575		
1941	20,116,678	14,308,812	12,328,575	7,500,000	6,470,000	371,160	20,084,330	0	0	20,084,330	17,304,802	Flow Adjustments:	
1942	17,225,136	20,084,330	17,304,802	7,500,000	6,470,000	462,377	22,877,090	0	0	22,877,090	19,711,064	1971	203,226 af
1943	13,731,401	22,877,090	19,711,064	7,500,000	6,470,000	484,411	22,154,080	0	0	22,154,080	19,088,114	1972	226,985 af
1944	15,369,422	22,154,080	19,088,114	7,500,000	6,470,000	486,433	23,067,069	0	0	23,067,069	19,874,751	1973	252,377 af
1945	14,140,528	23,067,069	19,874,751	7,500,000	6,470,000	492,723	22,744,874	0	0	22,744,874	19,597,146	1974	196,384 af
1946	11,095,453	22,744,874	19,597,146	7,500,000	6,470,000	453,859	19,416,468	0	0	19,416,468	16,729,368	1975	246,665 af
1947	16,439,486	19,416,468	16,729,368	7,500,000	6,470,000	440,031	21,445,923	0	0	21,445,923	18,477,961	1976	173,250 af
1948	15,139,294	21,445,923	18,477,961	7,500,000	6,470,000	469,090	22,146,127	0	0	22,146,127	19,081,262	1977	112,291 af
1949	16,933,584	22,146,127	19,081,262	7,500,000	6,470,000	502,742	24,606,969	0	0	24,606,969	21,201,541	1978	152,187 af
1950	13,140,416	24,606,969	21,201,541	7,500,000	6,470,000	514,629	23,262,756	0	0	23,262,756	20,043,357	1979	153,559 af
1951	12,505,894	23,262,756	20,043,357	7,500,000	6,470,000	479,627	21,319,023	0	0	21,319,023	18,368,623	1980	161,893 af
1952	20,805,422	21,319,023	18,368,623	7,500,000	6,470,000	526,102	27,628,343	0	0	27,628,343	23,804,778		
1953	11,165,419	27,628,343	23,804,778	7,500,000	6,470,000	557,478	24,266,285	0	0	24,266,285	20,908,004		
1954	8,496,102	24,266,285	20,908,004	7,500,000	6,470,000	458,530	18,333,856	0	0	18,333,856	15,796,582		
1955	9,413,908	18,333,856	15,796,582	7,500,000	6,470,000	343,218	13,434,547	0	0	13,434,547	11,575,301		
1956	11,426,874	13,434,547	11,575,301	7,500,000	6,470,000	261,206	10,630,214	0	0	10,630,214	9,159,069		
1957	21,500,963	10,630,214	9,159,069	7,500,000	6,470,000	308,243	17,852,934	0	0	17,852,934	15,382,216		
1958	15,862,511	17,852,934	15,382,216	7,500,000	6,470,000	401,013	19,344,432	0	0	19,344,432	16,667,301		
1959	9,598,169	19,344,432	16,667,301	7,500,000	6,470,000	366,449	14,606,152	0	0	14,606,152	12,584,765		
1960	11,524,160	14,606,152	12,584,765	7,500,000	6,470,000	286,914	11,873,398	0	0	11,873,398	10,230,205		
1961	10,010,259	11,873,398	10,230,205	7,500,000	6,470,000	213,396	7,700,263	0	0	7,700,263	6,634,601		
1962	17,377,609	7,700,263	6,634,601	7,500,000	6,470,000	203,083	10,904,789	0	0	10,904,789	9,395,644		
1963	8,840,900	10,904,789	9,395,644	7,500,000	6,470,000	180,671	5,595,018	0	0	5,595,018	4,820,707		
1964	10,863,586	5,595,018	4,820,707	7,500,000	6,470,000	90,114	2,398,489	0	0	2,398,489	2,066,556		
1965	19,875,027	2,398,489	2,066,556	7,500,000	6,470,000	117,696	6,185,621	0	0	6,185,621	7,052,962		
1966	10,679,844	8,185,821	7,052,962	7,500,000	6,470,000	142,760	4,752,904	0	0	4,752,904	4,095,136		
1967	11,670,830	4,752,904	4,095,136	7,500,000	6,470,000	80,877	2,372,858	0	0	2,372,858	2,044,471		
1968	13,739,932	2,372,858	2,044,471	7,500,000	6,470,000	52,531	2,090,259	0	0	2,090,259	1,800,982		
1969	15,272,159	2,090,259	1,800,982	7,500,000	6,470,000	62,717	3,329,701	0	0	3,329,701	2,868,894		
1970	15,344,136	3,329,701	2,868,894	7,500,000	6,470,000	89,587	4,614,250	0	0	4,614,250	3,975,671		
1971	15,493,659	4,614,250	3,975,671	7,500,000	6,470,000	118,224	6,019,685	0	0	6,019,685	5,186,504		
1972	13,186,637	6,019,685	5,186,504	7,500,000	6,470,000	123,531	5,112,790	0	0	5,112,790	4,405,217		
1973	18,650,193	5,112,790	4,405,217	7,500,000	6,470,000	161,977	9,631,000	0	0	9,631,000	8,298,144		
1974	13,285,426	9,631,000	8,298,144	7,500,000	6,470,000	200,653	8,745,798	0	0	8,745,798	7,535,427		
1975	17,072,661	8,745,798	7,535,427	7,500,000	6,470,000	221,897	11,626,544	0	0	11,626,544	10,017,513		
1976	11,313,561	11,626,544</											

Upper Basin Yield Mass Balance Analysis

Run 8 - Use CRSP Minimum Power Pools, 7.50 maf Lower Basin Delivery, 6% Overall Shortage

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry- Over Storage (plus)	CRSP Carry- Over Storage	Lower Basin Delivery (minus)	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Subtotal	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year- end Storage	Variables	
1906	18,550,021	33,833,590	29,151,263	7,500,000	6,760,000	725,390	37,398,221	3,564,631	0	33,833,590	29,151,263	Storage	35,233,298 af
1907	21,201,694	33,833,590	29,151,263	7,500,000	6,760,000	725,390	40,049,894	6,216,304	0	33,833,590	29,151,263	Sedimentation Rate (Active)	37,000 af/yr
1908	12,218,817	33,833,590	29,151,263	7,500,000	6,760,000	696,247	31,096,160	0	0	31,096,160	26,792,673	Bank Storage	4%
1909	22,356,301	33,833,590	29,151,263	7,500,000	6,760,000	696,247	38,496,213	4,662,623	0	33,833,590	29,151,263	Adjusted Storage (2060)	33,833,590 af
1910	14,850,616	33,833,590	29,151,263	7,500,000	6,760,000	721,863	33,502,343	0	0	33,502,343	28,865,858	UB Demand Level	6,760,000 af/yr
1911	15,499,729	33,833,590	29,151,263	7,500,000	6,760,000	721,863	34,020,209	186,619	0	33,833,590	29,151,263	LB Delivery	7,500,000 af/yr
1912	18,623,410	33,833,590	29,151,263	7,500,000	6,760,000	725,390	37,471,610	3,638,020	0	33,833,590	29,151,263		
1913	14,536,373	33,833,590	29,151,263	7,500,000	6,760,000	720,660	33,389,303	0	0	33,389,303	28,768,462		
1914	21,354,814	33,833,590	29,151,263	7,500,000	6,760,000	720,660	39,765,457	5,929,867	0	33,833,590	29,151,263		
1915	13,623,277	33,833,590	29,151,263	7,500,000	6,760,000	711,041	32,485,825	0	0	32,485,825	27,990,019	Results	
1916	20,142,892	32,485,825	27,990,019	7,500,000	6,760,000	711,041	37,657,676	3,824,086	0	33,833,590	29,151,263	Average CRSP Evap	416,577 af/yr
1917	22,942,804	33,833,590	29,151,263	7,500,000	6,760,000	725,390	41,791,004	7,957,414	0	33,833,590	29,151,263	Total Yield w/ CRSP evap	7,176,577 af/yr
1918	15,865,939	33,833,590	29,151,263	7,500,000	6,760,000	725,390	34,714,139	880,549	0	33,833,590	29,151,263		
1919	12,651,369	33,833,590	29,151,263	7,500,000	6,760,000	700,804	31,524,155	0	0	31,524,155	27,161,438		
1920	22,287,632	31,524,155	27,161,438	7,500,000	6,760,000	700,804	38,850,983	5,017,394	0	33,833,590	29,151,263	Shortage Years	Shortage
1921	22,526,781	33,833,590	29,151,263	7,500,000	6,760,000	725,390	41,374,981	7,541,391	0	33,833,590	29,151,263	1963	1,436,832 af
1922	18,447,198	33,833,590	29,151,263	7,500,000	6,760,000	725,390	37,295,398	3,461,808	0	33,833,590	29,151,263	1964	3,401,431 af
1923	19,024,046	33,833,590	29,151,263	7,500,000	6,760,000	725,390	37,872,246	4,038,656	0	33,833,590	29,151,263	1964	727,706 af
1924	13,877,798	33,833,590	29,151,263	7,500,000	6,760,000	713,723	32,737,665	0	0	32,737,665	28,207,007	1968	525,085 af
1925	14,430,701	32,737,665	28,207,007	7,500,000	6,760,000	696,458	32,211,908	0	0	32,211,908	27,754,010	1977	3,913,425 af
1926	15,213,731	32,211,908	27,754,010	7,500,000	6,760,000	693,630	32,472,009	0	0	32,472,009	27,978,115		
1927	19,539,212	32,472,009	27,978,115	7,500,000	6,760,000	710,894	37,040,326	3,206,736	0	33,833,590	29,151,263	NM allocation (w/o evap)	754,875 af/yr
1928	16,934,334	33,833,590	29,151,263	7,500,000	6,760,000	725,390	35,802,534	1,968,944	0	33,833,590	29,151,263		
1929	21,829,585	33,833,590	29,151,263	7,500,000	6,760,000	725,390	40,677,785	6,844,195	0	33,833,590	29,151,263		
1930	14,621,041	33,833,590	29,151,263	7,500,000	6,760,000	721,552	33,473,079	0	0	33,473,079	28,840,644	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1931	8,474,134	33,473,079	28,840,644	7,500,000	6,760,000	649,207	27,038,006	0	0	27,038,006	23,296,139		
1932	17,422,187	27,038,006	23,296,139	7,500,000	6,760,000	607,893	29,592,300	0	0	29,592,300	25,496,937		
1933	12,183,500	29,592,300	25,496,937	7,500,000	6,760,000	606,523	26,909,278	0	0	26,909,278	23,185,226		
1934	6,178,192	26,909,278	23,185,226	7,500,000	6,760,000	486,740	18,340,729	0	0	18,340,729	15,802,503		
1935	12,630,349	18,340,729	15,802,503	7,500,000	6,760,000	374,189	16,336,890	0	0	16,336,890	14,075,981	Total Upper Basin depletion, inc. CRSP evap:	
1936	14,648,873	16,336,890	14,075,981	7,500,000	6,760,000	353,236	16,372,527	0	0	16,372,527	14,106,686	1953-1977	6,882,966 af/yr
1937	14,306,056	16,372,527	14,106,686	7,500,000	6,760,000	350,375	16,068,208	0	0	16,068,208	13,844,483	1931-1977	7,019,645 af/yr
1938	18,148,319	16,068,208	13,844,483	7,500,000	6,760,000	384,437	19,572,090	0	0	19,572,090	16,863,452	1906-2000	7,176,577 af/yr
1939	11,164,059	19,572,090	16,863,452	7,500,000	6,760,000	384,685	16,091,464	0	0	16,091,464	13,864,520		
1940	9,931,657	16,091,464	13,864,520	7,500,000	6,760,000	298,375	11,464,746	0	0	11,464,746	9,878,107		
1941	20,116,678	11,464,746	9,878,107	7,500,000	6,760,000	308,188	17,013,235	0	0	17,013,235	14,658,725	Flow Adjustments:	
1942	17,225,136	17,013,235	14,658,725	7,500,000	6,760,000	394,622	19,583,749	0	0	19,583,749	16,873,498	1971	203,226 af
1943	13,731,401	19,583,749	16,873,498	7,500,000	6,760,000	411,974	18,643,176	0	0	18,643,176	16,063,094	1972	226,985 af
1944	15,369,422	18,643,176	16,063,094	7,500,000	6,760,000	409,413	19,343,185	0	0	19,343,185	16,666,227	1973	252,377 af
1945	14,140,528	19,343,185	16,666,227	7,500,000	6,760,000	411,216	18,812,498	0	0	18,812,498	16,208,983	1974	196,384 af
1946	11,095,453	18,812,498	16,208,983	7,500,000	6,760,000	367,959	15,279,991	0	0	15,279,991	13,165,350	1975	246,665 af
1947	16,439,486	15,279,991	13,165,350	7,500,000	6,760,000	349,831	17,109,646	0	0	17,109,646	14,741,793	1976	173,250 af
1948	15,139,294	17,109,646	14,741,793	7,500,000	6,760,000	374,681	17,614,259	0	0	17,614,259	15,176,571	1977	112,291 af
1949	13,140,416	17,614,259	15,176,571	7,500,000	6,760,000	404,213	19,883,630	0	0	19,883,630	17,131,878	1978	152,187 af
1950	16,933,584	19,883,630	17,131,878	7,500,000	6,760,000	412,066	18,351,980	0	0	18,351,980	15,812,197	1979	153,559 af
1951	12,505,894	18,351,980	15,812,197	7,500,000	6,760,000	373,115	16,224,759	0	0	16,224,759	13,979,368	1980	161,893 af
1952	20,805,422	16,224,759	13,979,368	7,500,000	6,760,000	445,724	22,354,457	0	0	22,354,457	19,260,760		
1953	11,165,419	22,354,457	19,260,760	7,500,000	6,760,000	413,316	18,816,559	0	0	18,816,559	16,212,482		
1954	8,498,102	18,816,559	16,212,482	7,500,000	6,760,000	340,664	12,711,997	0	0	12,711,997	10,952,748		
1955	9,413,908	12,711,997	10,952,748	7,500,000	6,760,000	221,725	7,644,180	0	0	7,644,180	6,586,280		
1956	11,426,874	7,644,180	6,586,280	7,500,000	6,760,000	136,164	4,674,890	0	0	4,674,890	4,027,919		
1957	21,500,963	4,674,890	4,027,919	7,500,000	6,760,000	179,756	11,736,128	0	0	11,736,128	10,111,931		
1958	15,862,511	11,736,128	10,111,931	7,500,000	6,760,000	269,094	13,069,545	0	0	13,069,545	11,260,813		
1959	9,598,169	13,069,545	11,260,813	7,500,000	6,760,000	231,189	8,176,515	0	0	8,176,515	7,044,944		
1960	11,124,160	8,176,515	7,044,944	7,500,000	6,760,000	148,403	5,292,272	0	0	5,292,272	4,559,859		
1961	10,010,259	5,292,272	4,559,859	7,500,000	6,760,000	71,893	970,838	0	0	970,838	836,481		
1962	17,377,609	970,838	836,481	7,500,000	6,760,000	58,257	4,030,190	0	0	4,030,190	3,472,440		
1963	8,840,900	4,030,190	3,472,440	7,500,000	6,760,000	47,922	-1,436,832	0	1,436,832	0	0		
1964	10,863,586	0	0	7,500,000	6,760,000	5,017	-3,401,431	0	3,401,431	0	0		
1965	19,875,027	0	0	7,500,000	6,760,000	64,111	5,550,916	0	0	5,550,916	4,782,709		
1966	10,679,844	5,550,916	4,782,709	7,500,000	6,760,000	84,195	1,886,565	0	0	1,886,565	1,625,478		
1967	11,670,830	1,886,565	1,625,478	7,500,000	6,760,000	25,101	-727,706	0	727,706	0	0		
1968	13,739,932	0	0	7,500,000	6,760,000	5,017	-525,085	0	525,085	0	0		
1969	15,272,159	0	0	7,500,000	6,760,000	15,626	996,533	0	0	996,533	858,620		
1970	15,344,136	996,533	858,620	7,500,000	6,760,000	37,378	2,043,291	0	0	2,043,291	1,760,514		
1971	15,493,659	2,043,291	1,760,514	7,500,000	6,760,000	61,006	3,215,943	0	0	3,215,943	2,770,880		
1972	13,186,637	3,215,943	2,770,880	7,500,000	6,760,000	61,409	2,081,171	0	0	2,081,171	1,793,152		
1973	18,650,193	2,081,171	1,793,152	7,500,000	6,760,000	95,054	6,376,310	0	0	6,376,310	5,493,874		
1974	13,285,426	6,376,310	5,493,874	7,500,000	6,760,000	129,030	5,272,706	0	0	5,272,706	4,543,001		
1975	17,072,661	5,272,706	4,543,001	7,500,000	6,760,000	145,874	7,939,693	0	0	7,939,693	6,840,897		
1976	11,313,561	7,939,693	6,840,897	7,500,000	6,760,000	141,196	4,852,059	0	0	4,852,059	4,180,569		

APPENDIX B - Reservoir Storage

Upper Colorado River Basin Reservoir Storage

Upper Colorado River Basin Reservoirs	Complete	Live Capacity	CRSP Live	CRSP Active	CRSP Active +Other	State	Major Basin	Hydromet	Source
1 Big Sandy	X	38,900			38,900	WY	GR	BGRW	Hydromet
2 Blue Mesa	X	829,500	829,500	748,500	748,500	CO	CR	BMDC	Hydromet
3 Boulder Lake	X	22,280			22,280	WY	GR	Jade Henderson Superintendent for Region IV	
4 Bottle Hollow		11,779			11,779	UT	GR	BHRU	
5 Crawford	X	13,970			13,970	CO	CR	CFRC	Erik Knight from GJ office
6 Crystal	X	17,536	17,536	13,000	13,000	CO	CR	CRRC	Hydromet
7 Current Creek	X	15,460			15,460	UT	GR	CURU	Hydromet
8 Dillon	X	252,678			252,678	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wet/reservoir/resv_rpt.html NRCS Website
9 Eden		13,164			13,164	WY	GR	EDRU	
10 Electric Lake - Utah Power and Light	X	31,500			31,500	UT	GR		Connelly Baldwin at Pacific Corp. Connelly.Baldwin@pacifiCorp.com or 801-220-4636
11 Elbow	X	16,400			16,400	CO	GR		Bill Earley with the City of Craig Public Works Dept. 970-826-2014
12 Flaming Gorge	X	3,749,000	3,749,000	3,515,700	3,515,700	UT	GR	FGRU	Hydromet
13 Fontenelle	X	344,800			344,800	WY	GR	FTRW	Hydromet
14 Fremont Lake	X	30,899			30,899	WY	GR		Jade Henderson Superintendent for Region IV
15 Gould	X	10,380			10,380	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dw.state.co.us
16 Fruitgrowers	X	4,460			4,460	CO	CR	FGRC	Hydromet
17 Granby	X	540,033			540,033	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wet/reservoir/resv_rpt.html
18 Green Mountain	X	153,678			153,678	CO	CR	GMRC	NRCS Website http://www.wcc.nrcs.usda.gov/wet/reservoir/resv_rpt.html
19 Groundhog	X	27,500			27,500	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wet/reservoir/resv_rpt.html
20 Gurley	X	12,035			12,035	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dw.state.co.us
21 Homestake	X	42,882			42,882	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wet/reservoir/resv_rpt.html
22 Jackson Gulch	X	9,951			9,951	CO	CR	JGRC	Hydromet
23 Joe's Valley	X	61,590			61,590	UT	GR	JVRU	Hydromet
24 Johnson		15,300			15,300	CO	CR		
25 Kenny Reservoir (Taylor Dam)	X	9,400			9,400	CO	CR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
26 Lake Powell	X	24,322,000	24,322,000	20,309,919	20,309,919	AZ	CR	GLDA	Hydromet
27 Lake Vista Naughton	X	89,645			89,645	WY	GR		Connelly Baldwin at Pacific Corp. Connelly.Baldwin@pacifiCorp.com or 801-220-4636
28 Lemon	X	39,792			39,792	CO	SJR	LMRC	Hydromet
29 Long Park		14,600			14,600	UT	GR		
30 McPhee	X	247,400			247,400	CO	CR	MCRC	Hydromet
31 Meeks Cabin	X	29,870			29,870	WY	GR	MERW	Hydromet
32 Mifflin	X	20,000			20,000	UT	GR		
33 Montrose	X	11,620			11,620	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dw.state.co.us
34 Moon Lake	X	49,500			49,500	UT	GR	MNLU	Hydromet
35 Morgan Lake Dam		42,800			42,800	NM	SJR		
36 Morrow Point	X	117,025	117,025	42,120	42,120	CO	CR	MPRC	Hydromet
37 Narraguinep	X	22,700			22,700	CO	SJR		NRCS Website http://www.wcc.nrcs.usda.gov/wet/reservoir/resv_rpt.html
38 Navajo	X	1,696,000	1,696,000	1,036,100	1,036,100	NM	SJR	NVRN	Hydromet
39 New Fork Lake	X	20,340			20,340	WY	GR		Jade Henderson Superintendent for Region IV
40 Paonia	X	16,703			16,703	CO	CR	PARC	Hydromet
41 Pelican Lake		15,650			15,650	UT	GR		
42 Pleasant Valley (Lake Catam)	X	7,275			7,275	CO	CR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
43 Recapture Creek		16,000			16,000	UT	GR		
44 Redfeet	X	25,700			25,700	UT	GR	RFRU	Hydromet
45 Ridgway	X	82,980			82,980	CO	CR	RWRC	Hydromet
46 Rifle Gap	X	12,708			12,708	CO	CR	RGRC	Hydromet
47 Ruedi	X	102,330			102,330	CO	CR	RURC	Great Planes Region Website
48 Scofield	X	65,800			65,800	UT	GR	SFRU	Hydromet
49 Shadow Mountain	X	18,368			18,368	CO	CR	SMRC	Great Planes Region Website
50 Shiver Jack	X	13,000			13,000	CO	CR	SJRC	Hydromet
51 Soldier Creek	X	1,105,910			1,105,910	UT	GR	SCRU	Hydromet
52 Stagecoach	X	33,275			33,275	CO	GR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
53 Starvation	X	165,320			165,320	UT	GR	SVRU	Hydromet
54 Stateline	X	13,880			13,880	WY	GR	SLRW	Hydromet
55 Steamboat Lake	X	25,400			25,400	CO	GR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
56 Steinsaker	X	34,455			34,455	UT	GR	STRU	Hydromet
57 Taylor Park	X	106,210			106,210	CO	CR	TPRC	Hydromet
58 Upper Stillwater	X	31,382			31,382	UT	GR	USRU	Hydromet
59 Vallejo	X	125,400			125,400	CO	SJR	VCRC	Hydromet
60 Vaga	X	33,311			33,311	CO	CR	VGRU	Erik Knight from GJ office
61 Williams Creek	X	10,084			10,084	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dw.state.co.us
62 Williams Fork	X	96,824			96,824	CO	CR	WFRU	Great Planes Region Website
63 Willow Lake	X	18,816			18,816	WY	GR		Jade Henderson Superintendent for Region IV
64 Willow Creek	X	10,550			10,550	CO	CR	WCRC	Great Planes Region Website
65 Wolford Mountain	X	66,000			66,000	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dw.state.co.us
66 Yampico	X	8,000			8,000	CO	GR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
Total Capacity		35,233,298	30,731,061	25,665,339	30,167,576				

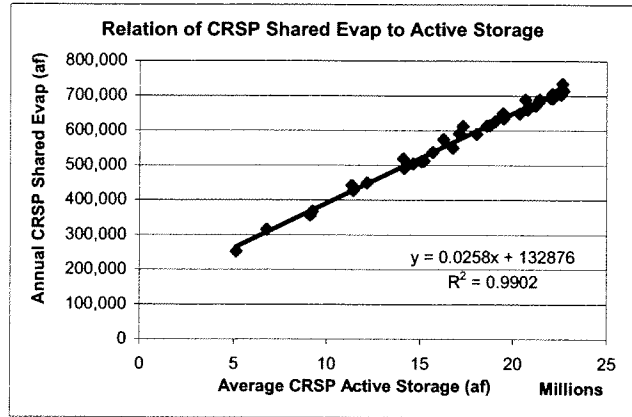
APPENDIX C - CRSP Evaporation Analysis

Relationships of CRSP Shared Reservoir Evaporation to Total CRSP Storage

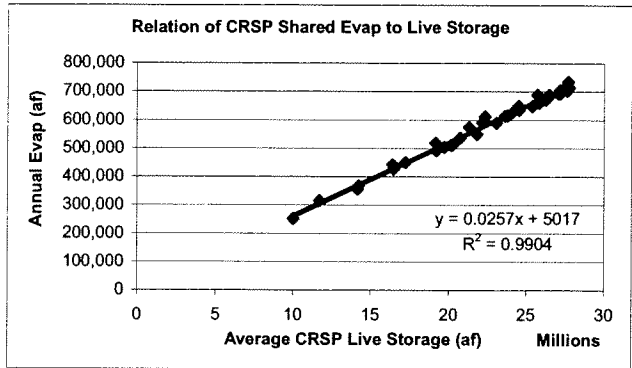
<u>Year</u>	<u>Average CRSP Live Storage (af)</u>	<u>Average CRSP Active Storage (af)</u>	<u>CRSP Shared Evap (af)</u>
1968	10,006,534	5,123,250	251,646
1969	11,701,142	6,764,000	315,083
1970	14,222,401	9,231,741	367,164
1971	16,417,858	11,354,088	442,260
1972	17,229,715	12,165,945	449,544
1973	19,703,066	14,639,296	504,409
1974	22,158,563	17,094,793	590,940
1975	23,634,096	18,570,326	613,612
1976	24,105,743	19,041,973	626,694
1977	20,730,592	15,672,536	537,406
1978	19,158,480	14,106,380	519,065
1979	22,336,514	17,284,414	612,639
1980	25,709,770	20,657,670	688,502
1981	25,392,305	20,340,205	648,525
1982	25,835,729	20,783,629	666,691
1983	27,692,454	22,640,354	734,416
1984	27,759,568	22,707,468	714,727
1985	27,619,938	22,567,838	702,973
1986	27,414,909	22,362,809	706,131
1987	27,153,464	22,101,364	705,172
1988	26,465,639	21,413,539	689,455
1989	24,540,351	19,488,251	634,821
1990	21,806,134	16,754,034	549,702
1991	20,141,572	15,089,472	510,689
1992	19,208,740	14,156,640	491,352
1993	21,297,564	16,245,464	573,884
1994	23,080,796	18,028,696	589,440
1995	24,500,724	19,448,624	649,206
1996	26,252,053	21,199,953	671,123
1997	26,416,641	21,364,541	681,115
1998	27,174,302	22,122,202	693,294
1999	27,050,819	21,998,719	694,007
2000	25,830,330	20,778,230	660,675
2001	23,802,258	18,750,158	614,593
2002	20,256,954	15,204,854	512,030
2003	16,472,537	11,420,437	427,526
2004	14,160,551	9,108,451	355,545

Regression Analyses

Active Storage:



Live Storage:



Notes:

- (1) Historic calendar year data from Bureau of Reclamation. Average storage values are based on the average of the end-of-year storage amounts for the year indicated and for the previous year. Storage amounts include storage in all CRSP units, including Lake Powell, Flaming Gorge Reservoir, Navajo Reservoir and the Aspinall Unit (Blue Mesa, Morrow Point and Crystal reservoirs).
- (2) CRSP shared evaporation includes lake evaporation for Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs, and is shared between the Upper Division States in proportions to their Upper Colorado River Basin Compact Article III(a) apportionments. CRSP shared evaporation is approximately 10,000 af at zero live CRSP storage (5,000 af based on the regression analyses) and approximately 130,000 af if storage in all CRSP reservoirs were at the top of the inactive pools (133,000 af based on the regression analysis). Lake evaporation for Navajo Reservoir is not included in CRSP shared evaporation.
- (3) Data for the period 1968-2004 were used in the regression analyses. Data prior to 1968 do not reflect a normal distribution of storage between CRSP unit reservoirs under future operational conditions (for example, Navajo Reservoir storage remained below the top of the inactive pool required for operation of the Navajo Indian Irrigation Project diversion from 1962 when it began storing water until 1968, and Morrow Point Reservoir began operation in 1968). For the period 1968-1977, the historic average end-of-year CRSP storage and annual CRSP evaporation amount were increased to reflect the average storage of 15,670 af and average evaporation amount of 340 af occurring at Crystal Reservoir after its initial filling in 1978.

Historic Storage and Evaporation at Colorado River Storage Project Reservoirs

Year	Lake Powell		Flaming Gorge Reservoir		Navajo Reservoir		Blue Mesa Reservoir		Morrow Point Reservoir		Crystal Reservoir		Total All CRSP Reservoirs			
	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	EOY Active Storage (af)	Annual Evap (af)	Annual Shared Evap (af)
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	13,000	200	57,000	700	0	0	0	0	0	0	70,000	0	900	200
1963	970,000	25,000	883,500	20,000	331,834	8,323	0	0	0	0	0	0	2,185,334	650,500	53,323	45,000
1964	4,226,877	76,171	1,997,900	42,320	382,320	10,847	0	0	0	0	0	0	5,707,097	1,199,800	129,137	118,490
1965	6,755,838	144,900	2,395,300	47,402	404,111	14,630	0	0	0	0	0	0	9,565,248	5,026,100	207,031	192,401
1966	5,892,764	181,801	2,243,300	65,869	400,389	10,730	248,900	2,530	0	0	0	0	8,785,352	4,178,900	260,900	250,170
1967	6,237,331	158,145	2,288,300	66,614	588,132	13,048	321,500	4,500	0	0	0	0	9,435,263	4,641,100	242,308	229,259
1968	7,039,300	185,829	1,912,939	59,077	973,592	18,631	511,900	6,000	108,735	400	0	0	10,546,465	5,605,400	269,937	251,306
1969	9,527,661	252,105	1,565,599	54,074	1,043,002	22,326	652,343	8,064	35,875	500	0	0	12,824,480	7,922,600	337,068	314,743
1970	12,014,346	305,979	1,761,250	51,442	1,049,190	22,564	647,667	8,804	116,528	600	0	0	15,588,982	10,540,882	389,389	366,824
1971	12,973,499	365,252	2,704,322	68,523	991,296	20,505	431,077	7,297	115,200	848	0	0	17,215,394	12,167,294	452,425	441,920
1972	12,511,547	362,114	3,086,584	79,091	982,869	19,991	415,961	7,155	115,736	845	0	0	17,212,697	12,164,597	469,195	449,204
1973	17,397,040	417,269	2,938,138	77,932	1,112,631	28,408	598,694	8,028	115,592	839	0	0	22,162,095	17,113,995	532,477	504,069
1974	17,298,382	498,708	3,262,393	83,468	970,485	21,646	476,431	7,586	116,000	837	0	0	22,123,690	17,175,590	612,246	590,600
1975	19,846,968	521,418	3,430,797	83,664	1,186,693	26,432	533,575	7,360	116,128	831	0	0	25,113,161	20,065,061	639,704	613,272
1976	18,139,140	533,889	3,129,279	83,640	1,205,201	25,255	478,276	5,729	115,088	845	0	0	23,066,984	18,018,884	651,609	626,354
1977	15,050,687	467,624	1,990,703	62,863	979,818	22,439	235,328	7,871	115,868	840	7,714	100	18,378,288	13,326,188	559,605	537,166
1978	15,343,792	443,338	2,673,304	66,716	1,195,470	24,307	594,351	8,040	115,536	840	16,068	300	19,938,673	14,866,573	543,372	519,065
1979	20,395,402	536,289	2,971,444	67,120	1,233,240	27,623	579,788	8,040	115,536	848	17,244	349	24,734,354	19,682,254	640,261	612,639
1980	21,602,374	606,694	3,013,072	72,311	1,382,000	29,816	558,000	8,314	113,305	836	16,435	348	26,685,186	21,633,086	717,417	688,502
1981	19,810,804	566,573	2,783,198	74,001	1,234,201	26,237	340,276	6,763	114,242	839	16,703	349	24,099,424	19,047,324	674,762	648,525
1982	22,052,326	579,638	3,307,239	78,299	1,475,159	28,337	607,227	7,570	113,713	836	16,369	348	27,572,033	22,519,933	695,028	666,691
1983	22,095,450	638,967	3,451,988	85,654	1,545,720	30,691	593,402	8,563	113,018	842	13,297	350	27,812,875	22,760,775	765,108	734,416
1984	21,991,934	621,218	3,379,535	84,057	1,536,197	31,194	666,201	8,258	117,015	844	17,015	351	27,706,261	22,654,161	745,921	714,727
1985	22,324,682	613,950	3,116,566	80,358	1,392,531	31,206	567,471	8,373	115,476	842	16,900	350	27,533,616	22,481,516	734,179	702,973
1986	21,900,656	615,398	3,257,068	81,239	1,429,801	30,200	576,633	8,304	115,023	841	17,021	350	27,296,202	22,244,102	736,331	706,131
1987	22,041,008	613,810	3,216,414	81,897	1,075,143	24,350	547,283	8,279	113,913	839	16,965	349	27,010,728	21,958,626	729,523	705,172
1988	21,223,202	603,875	2,958,441	77,191	1,149,810	24,336	458,550	7,206	114,808	836	15,742	348	25,920,552	20,868,452	713,791	689,455
1989	18,292,024	551,911	2,943,401	73,516	1,230,357	26,906	563,467	8,217	114,531	832	16,369	346	23,160,150	18,108,050	661,727	634,821
1990	15,246,718	464,809	3,049,072	75,352	1,381,613	26,704	647,094	8,362	110,936	832	16,686	346	20,452,119	15,400,019	576,406	549,702
1991	14,251,955	420,198	3,328,132	80,305	1,551,852	30,621	571,167	9,008	111,922	831	15,997	346	19,831,025	14,778,925	541,310	510,689
1992	13,334,385	403,360	3,013,793	78,487	1,528,220	31,554	580,946	8,354	113,617	812	15,495	338	18,586,456	13,534,356	522,907	491,352
1993	18,402,436	483,699	3,137,500	80,461	1,567,023	30,954	594,902	8,354	112,000	832	14,811	346	24,008,671	18,956,571	604,838	573,884
1994	17,220,702	504,284	2,835,277	75,469	1,391,103	30,450	579,329	8,525	110,880	821	15,629	342	22,152,920	17,100,820	619,890	589,440
1995	21,392,360	560,150	3,285,793	79,319	1,461,480	30,153	586,169	8,569	109,120	825	13,607	343	26,848,529	21,796,429	679,359	649,206
1996	20,497,896	582,091	3,248,287	79,159	1,187,295	27,184	601,723	8,307	105,401	823	14,976	343	25,655,578	20,603,478	698,308	671,123
1997	21,595,054	592,707	3,323,228	78,851	1,568,033	28,612	578,393	8,792	108,842	823	14,154	342	27,177,704	22,125,804	709,727	681,115
1998	21,654,054	605,297	3,399,837	78,646	1,412,077	29,148	577,927	8,180	110,739	827	16,265	344	27,107,899	22,118,799	722,442	693,294
1999	21,443,640	605,738	3,269,090	78,352	1,500,893	27,969	585,147	8,749	112,771	825	15,198	343	26,930,739	21,878,639	721,976	694,007
2000	19,823,236	576,998	2,991,270	74,194	1,288,792	26,850	594,611	8,409	107,722	829	14,289	345	24,729,920	19,677,820	687,525	660,675
2001	17,995,952	532,968	2,876,393	72,363	1,334,015	26,563	544,265	8,102	109,410	819	14,561	341	22,874,596	17,822,496	641,156	614,593
2002	13,773,841	436,496	2,631,819	67,919	826,816	20,891	283,191	6,507	109,636	783	14,009	326	17,639,312	12,587,212	532,921	512,030
2003	11,486,774	352,779	2,606,058	67,223	710,076	17,085	376,564	6,359	111,708	823	14,582	343	15,305,762	10,253,662	444,611	427,526
2004	8,663,616	278,349	2,742,643	68,248	991,373	20,353	491,453	7,778	109,666	826	16,589	344	13,015,340	7,963,240	375,898	355,545

- Notes:
- Lake Powell statistics: Dead storage 1,893,000 af at elevation 3370; Live storage capacity 24,322,000 af between elevations 3370 and 3700; Active storage capacity 20,325,000 af between elevations 3490 and 3700. Storage began March 1963.
 - Flaming Gorge Reservoir statistics: Dead storage 39,700 af at elevation 5740; Live storage capacity 3,749,500 af between elevations 5740 and 6040; Active storage capacity 3,516,000 af between elevations 5871 and 6040. Storage began November 1962.
 - Navajo Reservoir statistics: Dead storage 12,600 af at elevation 5775; Live storage capacity 1,701,300 af between elevations 5775 and 6085; Active storage capacity 1,039,500 af between elevations 5990 and 6085. Storage began June 1962.
 - Aspinall Unit statistics:
 - Blue Mesa Reservoir - Dead storage 111,200 af at elevation 7358; Live storage capacity 829,600 af between elevations 7358 and 7519; Active storage capacity 748,800 af between elevations 7393 and 7519. Storage began October 1965. End-of-year 1965 total storage for Blue Mesa Reservoir was 85,240 af (0 live storage).
 - Morrow Point Reservoir - Dead storage 165 af at elevation 6808; Live storage capacity 117,000 af between elevations 6808 and 7160; Active storage capacity 42,000 af between elevations 7100 and 7160. Storage began January 1968.
 - Crystal Reservoir - Dead storage 8,000 af at elevation 6670; Live storage capacity 17,000 af between elevations 6670 and 6755; Active storage capacity 13,000 af between elevations 6700 and 6755. Storage began March 1977.
 - Total CRSP Live storage capacity is 30,736,400 af, and total CRSP Active storage capacity is 25,684,300 af. The total CRSP inactive storage capacity is 5,052,100 af.
 - Evaporation amounts were computed using the method and coefficients described in Historical Inflows, Colorado River Storage Project, Bureau of Reclamation (Tom Ryan), October 1993.
 - The following evaporation amounts are estimated from calculated evaporation for other years and relative total storage amounts: Lake Powell for 1963, Flaming Gorge Reservoir for 1962-63, Navajo Reservoir for 1962, Blue Mesa Reservoir for 1966-68, Morrow Point Reservoir for 1968-70, and Crystal Reservoir for 1977-78. These evaporation amounts for Flaming Gorge, Navajo and Blue Mesa reservoirs also were reduced for when storage began. Crystal Reservoir evaporation for 1979-2004 was estimated based on the evaporation amounts at Morrow Point Reservoir and the ratio of the surface area of Crystal Reservoir to the surface area of Morrow Point Reservoir at full capacity.
 - CRSP shared evaporation includes lake evaporation for Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs, and is shared between the Upper Division States in proportion to their Upper Colorado River Basin Compact Article III(a) apportionments. Lake evaporation for Navajo Reservoir is accounted separately.

APPENDIX D - New Mexico Depletion Schedule

STATE OF NEW MEXICO SCHEDULE OF ANTICIPATED UPPER BASIN DEPLETIONS
(Units: 1000 acre-feet per year)

	<u>2000</u>	<u>2010</u>	<u>2020</u>	<u>2030</u>	<u>2040</u>	<u>2050</u>	<u>2060</u>
IRRIGATION USES (1)							
Navajo Nation Irrigation:							
Navajo Indian Irrigation Project	150.0	215.0	250.0	270.0	270.0	270.0	270.0
Fruitland-Cambridge Irrigation Project	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Hogback-Cudei Irrigation Project	15.5	15.5	21.3	21.3	21.3	21.3	21.3
Chaco River drainage irrigation	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Crystal area irrigation	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Navajo Nation Irrigation Subtotal	176.9	241.9	282.7	302.7	302.7	302.7	302.7
Non-Navajo Irrigation:							
Above Navajo Dam (including Jicarilla)	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Upper San Juan (excluding Hammond)	10.3	10.3	10.3	10.3	10.3	10.3	10.3
Hammond Irrigation Project	12.1	12.1	12.1	12.1	12.1	12.1	12.1
Animas River ditches	40.7	40.7	40.7	40.7	40.7	40.7	40.7
La Plata River ditches	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Farmers Mutual Ditch	11.2	11.2	11.2	11.2	11.2	11.2	11.2
Jewett Valley Ditch	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Chaco River drainage irrigation	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Non-Navajo Irrigation Subtotal	86.5	86.5	86.5	86.5	86.5	86.5	86.5
Irrigation Total	263.4	328.4	369.2	389.2	389.2	389.2	389.2
STOCKPOND EVAPORATION AND STOCK USE							
	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MUNICIPAL AND DOMESTIC USES (1)							
Current Municipal and Industrial Uses	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Animas-La Plata Project:							
San Juan Water Commission	1.0	5.0	10.4	10.4	10.4	10.4	10.4
Navajo Nation	0.0	1.0	2.0	2.3	2.3	2.3	2.3
La Plata Conservancy District	0.0	0.0	0.8	0.8	0.8	0.8	0.8
Ridges Basin Reservoir Evaporation - NM share	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Animas-La Plata Project Subtotal	1.0	6.0	13.3	13.6	13.6	13.6	13.6
Navajo-Gallup Water Supply Project: (2)							
Navajo Nation	0.0	0.0	7.9	10.2	12.5	12.5	12.5
Jicarilla Apache Nation	0.0	0.0	0.8	1.0	1.2	1.2	1.2
Navajo-Gallup Project Subtotal (within Basin)	0.0	0.0	8.7	11.2	13.7	13.7	13.7
Navajo Nation Municipal Use, Future (exc. NGWSP)	0.0	0.0	1.0	1.0	2.0	2.0	2.0
Jicarilla Apache Nation Municipal Use (exc. NGWSP)	0.0	0.0	0.0	0.4	0.6	0.6	0.6
Scattered Rural Domestic (including Jicarilla)	1.0	1.0	1.0	1.1	1.1	1.2	1.2
Municipal and Domestic Total	11.7	16.7	33.7	37.0	40.7	40.8	40.8
POWER AND INDUSTRIAL USES							
PNM - Navajo Reservoir contract (3)	16.2	16.2	16.2	16.2	16.2	16.2	16.2
BHP Billiton	37.0	37.0	38.0	39.0	39.0	39.0	39.0
Bloomfield Industrial	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Navajo Nation - Shiprock	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Navajo-Gallup Water Supply Project - NAPI (2)	0.0	0.0	0.7	0.7	0.7	0.7	0.7
Small Navajo Reservoir Contracts	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Power and Industrial Total	56.1	56.1	57.8	58.8	58.8	58.8	58.8
EXPORTS							
San Juan-Chama Project	105.2	105.2	105.2	105.2	105.2	105.2	105.2
Navajo-Gallup Water Supply Project: (2)							
Navajo Nation in New Mexico	0.0	0.0	4.0	5.8	7.6	7.6	7.6
City of Gallup	0.0	0.0	4.7	6.1	7.5	7.5	7.5
Navajo-Gallup Project Subtotal (Export)	0.0	0.0	8.7	11.9	15.1	15.1	15.1
Export Total	105.2	105.2	113.9	117.1	120.3	120.3	120.3
RESERVOIR EVAPORATION							
Navajo Reservoir Evaporation	28.3	28.0	27.7	27.7	27.7	27.7	27.7
Small Reservoir Evaporation	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Reservoir Evaporation Total	29.5	29.2	28.9	28.9	28.9	28.9	28.9
TOTAL DEPLETIONS (4)							
State Share of Upper Basin Yield (5)	469.9	539.6	607.5	635.0	641.9	642.0	642.0
Remaining Available (5,6)	642.4	642.4	642.4	642.4	642.4	642.4	642.4
Percent of State Share Remaining	172.5	102.8	34.9	7.4	0.5	0.4	0.4
	26.9%	16.0%	5.4%	1.2%	0.1%	0.1%	0.1%

NOTES:

(1) Does not reflect post-1965 transfers from irrigation to municipal and industrial uses.

(2) Proposed Navajo-Gallup Water Supply Project depletions in New Mexico total 29,500 acre-feet per year. Exports to Gallup are anticipated to be supplied through a subcontract with the Jicarilla Apache Nation. Exports for Navajo Nation uses in Arizona are

(3) Supplied through a subcontract with the Jicarilla Apache Nation.

(4) This is a schedule of anticipated depletions for planning purposes only. It is not a tabulation or determination of water rights or actual uses. Total depletions exclude New Mexico's share of reservoir evaporation from the major reservoirs constructed

(5) This depletion schedule does not attempt to interpret the Colorado River Compact, the Upper Colorado River Basin Compact, or any other element of the "Law of the River." This schedule should not be construed as an acceptance of any assumption that limit

(6) Reserved.

APPENDIX E - Upper Colorado River Commission Resolution

**RESOLUTION OF THE
UPPER COLORADO RIVER COMMISSION**

Regarding the Availability of Water from Navajo Reservoir for Navajo Nation Uses
within the State of New Mexico

WHEREAS, the State of New Mexico has proposed the Navajo-Gallup Water Supply Project to provide a needed renewable water supply from the San Juan River for municipal and domestic uses for Indian and non-Indian communities located within New Mexico in both the Upper Basin and the Lower Basin; and

WHEREAS, the State of New Mexico and the Navajo Nation on April 19, 2005, executed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (the "Settlement Agreement"), which is conditioned upon, among other things, the implementation of the Navajo Nation components of the Navajo-Gallup Water Supply Project within New Mexico; and

WHEREAS, the source of water supply for the proposed Navajo-Gallup Water Supply Project would be Navajo Reservoir and the San Juan River in New Mexico; and

WHEREAS, water from Navajo Reservoir and the San Juan River would be delivered to the proposed Navajo-Gallup Water Supply Project to meet the water demands of Navajo Nation communities in New Mexico through a proposed Settlement Contract between the United States, acting through the Secretary of the Interior, and the Navajo Nation (Appendix 4 to the Settlement Agreement); and

WHEREAS, Public Law 87-483 at section 11(a) requires that no new long-term contracts "... shall be entered into for the delivery of water stored in Navajo Reservoir or any other waters of the San Juan River and its tributaries, as aforesaid, until the Secretary has determined by hydrologic investigations that sufficient water to fulfill said contract is reasonably likely to be available for use in the State of New Mexico during the term thereof under the allocations made in articles III and XIV of the Upper Colorado River Basin compact, and has submitted such determination to the Congress of the United States and the Congress has approved such contracts"; and

WHEREAS, pursuant to Public Law 87-483, and in furtherance of the Jicarilla Apache Tribe Water Rights Settlement Act of 1992 and the Navajo Reservoir water supply contract approved by said Act, the Secretary of the Interior on February 2, 1989, approved the report on "Hydrologic Determination, 1988, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico" (the "1988 Hydrologic Determination"); and

WHEREAS, the 1988 Hydrologic Determination evaluated the availability of water from the Navajo Reservoir supply for uses in New Mexico through the 2040 planning horizon; and

WHEREAS, an update and extension to the 1988 Hydrologic Determination is needed to evaluate the availability of water from the Navajo Reservoir supply through a 2060 planning horizon under the allocation of water made to the State of New Mexico by the Upper Colorado River Basin Compact for the purpose of furthering Congressional legislative approval of the Settlement Agreement, the authorization of the proposed Navajo-Gallup Water Supply Project, and the legislative approval of the proposed Settlement Contract for the Navajo Nation's project uses in New Mexico; and

WHEREAS, the proposed Settlement Contract between the United States and the Navajo Nation would provide water supplies for Navajo Nation uses in New Mexico under both the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project which was authorized by Public Law 87-483, and would supersede the existing Navajo Reservoir water supply contract for the Navajo Indian Irrigation Project; and

WHEREAS, the US Bureau of Reclamation has presented to the Upper Colorado River Commission for its consideration a draft hydrologic determination, dated May 2006, that evaluates the availability of water from the Navajo Reservoir supply through 2060 and shows: (1) at least 5.76 million acre-feet of water is reasonably available annually for use by the Upper Basin, exclusive of reservoir evaporation at Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs of the Colorado River Storage Project; and (2) sufficient water is reasonably likely to be available from the Navajo Reservoir supply to fulfill the proposed Settlement Contract for the Navajo Nation's uses in New Mexico under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project, in addition to existing Navajo Reservoir water supply contracts for other uses, under the allocations made to New Mexico in Articles III and XIV of the Upper Colorado River Basin Compact; and

WHEREAS, the Settlement Agreement would provide at subparagraph 9.3.1: "The Navajo Nation and the United States agree that the State of New Mexico may administer in priority water rights in the San Juan River Basin in New Mexico, including rights of the Navajo Nation, as may be necessary for New Mexico to comply with its obligations under interstate compacts and other applicable law"; and

WHEREAS, the Upper Colorado River Commission supports water resource development in the Upper Colorado River Basin to enable the Upper Division States to fully develop their compact apportionments of Colorado River water while meeting compact obligations relating to the flow of the Colorado River at Lee Ferry; and

WHEREAS, it is the position of the Upper Colorado River Commission and the Upper Division States that, with the delivery at Lee Ferry of 75 million acre-feet of water in each period of ten consecutive years, the water supply available in the Colorado River

System below Lee Ferry is sufficient to meet the apportionments to the Lower Basin provided for in Articles III (a) and III (b) of the Colorado River Compact; and

WHEREAS, it is the position of the Upper Colorado River Commission and the Upper Division States that the obligation of the Upper Basin under Article III(c) of the Colorado River Compact to deliver water toward the Mexican Treaty obligation does not require the delivery at Lee Ferry of 0.75 million acre-feet of water annually; and

WHEREAS, the Upper Colorado River Commission anticipates that the Upper Division States will take all actions necessary to ensure that all Upper Basin States have access to their respective apportionments as specified in the Upper Colorado River Basin Compact; and

WHEREAS, the Upper Colorado River Commission on June 19, 2003, resolved that: (1) "the States of Colorado, New Mexico, Utah and Wyoming, support and to the extent necessary consent to the diversion of water from the Upper Basin for use in the Lower Basin solely within New Mexico via the proposed Navajo-Gallup Water Supply Project; provided, that any water so diverted by said project to the Lower Basin portion of New Mexico, being a depletion of water at Lee Ferry, shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III (a) of the Upper Colorado River Compact;" and (2) "the Upper Colorado River Commission supports such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project."

NOW, THEREFORE, BE IT RESOLVED by the Upper Colorado River Commission, that the Commission supports Congressional action to: (1) approve the Settlement Agreement; (2) authorize the proposed Navajo-Gallup Water Supply Project; and (3) approve the proposed Settlement Contract for the Navajo Nation's uses in New Mexico from the Navajo Reservoir supply under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project.

BE IT FURTHER RESOLVED, that while the Upper Colorado River Commission does not endorse all of the study assumptions used by the Bureau of Reclamation in its May 2006 draft hydrologic determination, including an assumption of a 6 percent allowable overall shortage, and specifically disagrees with the modeling assumption of a minimum Upper Basin delivery of 8.25 million acre-feet annually at Lee Ferry, the Commission supports a determination by the Secretary of the Interior that at least 5.76 million acre-feet of water is available annually for use by the Upper Basin, exclusive of reservoir evaporation at Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs of the Colorado River Storage Project.

BE IT FURTHER RESOLVED, that the Upper Colorado River Commission supports a determination by the Secretary of the Interior that sufficient water is reasonably likely to be available to fulfill the proposed Settlement Contract for the Navajo Nation's uses in New Mexico from the Navajo Reservoir supply under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project, in addition

to existing Navajo Reservoir water supply contracts for other uses, under the allocations made to New Mexico in Articles III and XIV of the Upper Colorado River Basin Compact.

BE IT FURTHER RESOLVED, that nothing in this Resolution, or resulting from the adoption of this Resolution, shall limit the right or ability of any Upper Basin State to develop the full apportionment made to it under the Colorado River Compact and the Upper Colorado River Basin Compact.

BE IT FURTHER RESOLVED, that a copy of this resolution be transmitted to the Regional Director, Upper Colorado Region, Bureau of Reclamation, Salt Lake City, Utah.

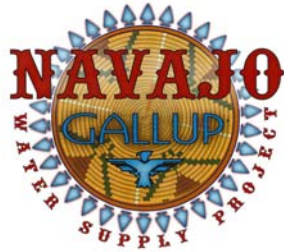
CERTIFICATE

I, Don A. Ostler, Executive Director and Secretary of the Upper Colorado River Commission, do hereby certify that the Upper Colorado River Commission adopted the above Resolution at its regular meeting held in Jackson Hole, Wyoming, on June 5, 2006.

WITNESS my hand this 9th day of June 2006.



DON A. OSTLER
Executive Director and Secretary



ATTACHMENT O

Principles for Conducting Endangered
Species Act Section 7 Consultations

**Principles for Conducting Endangered Species Act
Section 7 Consultations on Water Development
and Water Management Activities Affecting
Endangered Fish Species in the San Juan River Basin***

1.0 Endangered Species Act Compliance

The San Juan River Basin Recovery Implementation Program (Program) was established in 1991. The goals of the Program are:

1. To conserve populations of Colorado pikeminnow and razorback sucker in the Basin consistent with the recovery goals established under the Endangered Species Act.
2. To proceed with water development in the Basin in compliance with federal and state laws, interstate compacts, Supreme Court decrees, and federal trust responsibilities to the Southern Ute Indian Tribe, Ute Mountain Ute Tribe, Jicarilla Apache Tribe, and the Navajo Nation.

The Program is intended to provide measures for compliance with the Endangered Species Act (16 U.S.C. 1531 et seq.) (ESA) for water development and water management activities in the Basin.

These principles for conducting ESA section 7 consultations have been adopted by the Program's Coordination Committee. The principles have been reviewed by the U.S. Fish and Wildlife Service (Service) and found to be consistent with the ESA and its implementing regulations (50 CFR Part 402). These principles will be used as a guide to define how Program actions will be used to provide ESA compliance for impacts to listed fish species in the Basin from water development and water management activities.

2.0 Indian Trust Responsibilities

On June 5, 1997, the Secretaries of Commerce and the Interior signed Secretarial Order 3206. That Secretarial Order directed both Departments to carry out their responsibilities under the ESA in a manner that harmonizes the federal trust responsibility to the tribes, tribal sovereignty, and statutory missions of the Departments, and that strives to ensure that Indian tribes do not bear a disproportionate burden for the conservation of listed species, so as to avoid or minimize the potential for conflict and confrontation. In recognition of the vital role of the sovereign tribes in both water

* Adopted by the Coordination Committee, San Juan River Basin Recovery Implementation Program, June 19, 2001.

development and water management activities and endangered species conservation in the Basin, the Coordination Committee supports the Service in its commitment to notify the tribes when it receives any request for consultation that might affect tribal assets. Additionally the Coordination Committee urges the Service, consistent with the applicable regulations and policies, to address the section 7 consultation needs of the tribes. Moreover, the Coordination Committee recognizes that the Department of the Interior intends to use its authority to the fullest extent possible to preserve and protect the water resources of the tribes in the Basin.

3.0 Long Range Plan

The Program's initial Long Range Plan (LRP) was necessarily focused on the approximate seven-year research period as defined in the Service's October 25, 1991 Animas-La Plata biological opinion issued to the Bureau of Reclamation. The LRP defined the principal Program actions scheduled for completion through 1997. The efforts during the research period did not include implementation of specific, on-the-ground recovery actions that would directly benefit endangered fish or their habitat. Now that the initial research period has concluded, the Program's Biology Committee is in the process of identifying and prioritizing all foreseeable actions determined to be necessary to achieve recovery of endangered fish and their habitats in the Basin, including projects requiring capital construction funds, and is developing an updated LRP. The Coordination Committee will review the recommendations of the Biology Committee and adopt an updated LRP, incorporating capital, monitoring, and research projects as appropriate. The LRP, as amended and updated annually, will be the basis for formulating annual budgets, making funding requests to Congress and state legislatures for the Program, and provision of funding by Western Area Power Administration from power revenues pursuant to P.L. 106-392. The LRP will be reviewed annually by the Program and modified as needed to reflect new information and actions needed to achieve recovery while continuing with water development. Additionally, amendments to the LRP will reflect available funding and changes in priorities for implementation of recovery actions. Any actions proposed in the LRP will be in compliance with the ESA.

4.0 Incidental Take

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened fish and wildlife species, without a special exemption. Take of listed fish and wildlife species is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to these species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to these species to such an extent as to significantly disrupt normal behavior

patterns which include, but are not limited to breeding, feeding or sheltering. Incidental take is defined as take that results from, but is not the purpose of, carrying out an otherwise lawful activity.

Incidental take statements contained in biological opinions exempt federal action agencies and sponsors of water development and water management activities (project sponsors) from the ESA's section 9 prohibitions so long as they are in compliance with any reasonable and prudent measures and implementing terms and conditions that minimize take. The Service will include incidental take statements in all biological opinions for activities in the Basin, even when no take is anticipated. As stated in 50 CFR 402.14(i)(2) "reasonable and prudent measures along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration, or timing of the action and may involve only minor changes."

The reasonable and prudent measures provided in an incidental take statement are nondiscretionary, and must be undertaken so that they become binding conditions of any federal discretionary activity, for the exemption in section 7(o)(2) to apply. The federal agency has a continuing duty to regulate the activity covered by an incidental take statement included in a biological opinion. If the federal agency (1) fails to assume and implement the terms and conditions or (2) fails to retain oversight to ensure compliance with the terms and conditions, the protective coverage of section 7(o)(2) may lapse.

5.0 Section 7 Consultations

The Program is intended to identify and implement actions that assist in the recovery of the species and provide compliance with sections 7 and 9 of the ESA for water development and water management activities in the Basin. It is recognized that federal agencies and/or project sponsors may wish to carry out actions that provide ESA compliance for their activities independently of the Program, and not rely on the Program to provide actions for ESA compliance. In addition, federal agencies and/or project sponsors may modify their activities to eliminate or minimize adverse effects, avoid jeopardy, and/or avoid adverse modification of critical habitat, and by so doing, remove the need for actions by the Program to provide ESA compliance.

5.1 Consultations on New and Existing Water Development and Water Management Activities in the Basin

- A. For the purposes of the Program and section 7 consultations, it is assumed that:
 - (1) the Program will produce a list of actions defined in the LRP that can be implemented to assist in the recovery of the species,
 - (2) the funding will be available to implement the LRP,
 - (3) participants will take appropriate steps to implement those actions, and
 - (4) actions will be implemented in accordance with the schedule in the LRP, as periodically amended.

- B. Actions and accomplishments under the Program, as defined in the LRP, are intended to assist in the recovery of the species and provide the reasonable and prudent alternatives that avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat from water development and water management activities in the Basin. Program actions are also intended to provide the reasonable and prudent measures needed to minimize take of listed fish.

- C. When Section 7 consultation is initiated, the Service will determine if progress toward recovery has been sufficient for the Program to serve as a reasonable and prudent alternative or measure. The Service will also consider whether the probable success of the Program is compromised as a result of a specific water depletion or the cumulative effect of depletions. The Service will consider Program and non-Program actions throughout the Basin in evaluating the sufficiency of the Program to serve as a reasonable and prudent alternative or measure. The Service will make its assessment based on the best available scientific and commercial data as required by the ESA. The Service will assess the sufficiency of Program actions in proportion to the potential impacts of a proposed federal action. That is, the smaller the impact of a federal action, the lower the level of actions by the Program or others needed to avoid jeopardy and/or destruction or adverse modification of critical habitat.

The Service will determine whether progress by the Program is sufficient to provide a reasonable and prudent alternative or measure based on the following factors:

- 1. Actions that will result in a measurable positive population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction.
 - 2. Status of fish populations.
 - 3. Adequacy of flows.
 - 4. Magnitude of the impact of the activity (including, but not limited to, contaminant and fish migration impacts).
-
- D. If the Service finds during a Section 7 consultation that Program and non-Program accomplishments are sufficient as defined under C above, the biological opinions will identify the actions and accomplishments of the Program that support the Program serving as a reasonable and prudent alternative or measure.

- E. If the Service finds that progress of the Program is not sufficient at the time of the consultation, biological opinions in the Basin will be written to identify which action(s) in the LRP must be completed to provide the reasonable and prudent alternative or minimize take.
1. For existing activities, these actions will serve as the reasonable and prudent alternative or measure if they are completed according to the schedule identified in the LRP, as amended.
 2. For new activities, these actions will serve as a reasonable and prudent alternative or measure so long as they are completed before the impact from the activity occurs.
- F. The Service may conclude that some action not listed in the LRP is necessary to serve as a reasonable and prudent alternative or to minimize take for an activity under consultation. If this occurs, the Service will notify the Coordination Committee in writing, identify the additional action needed, and provide Committee members an opportunity to review the action, and incorporate the action into the LRP. Coordination with the Coordination Committee will not alter the time frame for consultation. Incorporation of new actions into the LRP under this paragraph is expected to be a rare event. If the reasonable and prudent alternative or measure is not incorporated into the LRP by the Coordination Committee, the Service will work with the federal agency and sponsor to ensure compliance with section 7.
- G. The Service will work with the federal action agency(ies) and project sponsors during consultation to attempt to identify mutually agreeable opportunities to minimize impacts. It is also recognized that: (1) it is the responsibility of the federal action agency(ies) to make the final determination of the definition of the activity brought to consultation, and (2) it is the Service's responsibility to make the determination as to whether jeopardy to any species and/or destruction or adverse modification of critical habitat will occur and to identify reasonable and prudent alternatives and measures for the activity.
- H. The Service has ultimate authority and responsibility for determining whether the Program has provided or can provide a reasonable and prudent alternative or measure. Final authority over what constitutes a reasonable and prudent alternative lies with Service. It is recognized that the Service retains the authority for determining section 7 compliance under the ESA.
- I. Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations provided by the Service in a biological opinion are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Program may be used to fulfill conservation recommendations provided by the Service to a federal action agency. However, compliance with section 7(a)(1) is the responsibility of federal agencies.

- J. The Program will be responsible for monitoring implementation of all Program actions, including those Program actions identified as reasonable and prudent alternatives and measures in biological opinions, and reporting results to the Service on an annual basis.

5.2 Service Review and Assessment of Program

Revisions to the LRP, including insertion of actions needed to achieve recovery, will normally occur in the annual review and update of the LRP, and all parties to the Program, including the Service, will make recommendations to update the LRP. If the Service concludes, at any time and independent of any consultation, that the Program is not implementing actions on schedule, and that this may impact the ability of the Program to provide reasonable and prudent alternatives or measures, the Service will provide a written assessment to the Coordination Committee. The assessment will include the Service's recommendations for corrective actions. The Coordination Committee, in cooperation with the Biology Committee, will have an opportunity to modify timing, funding, and/or priorities in the LRP to ensure that the Service can rely on the Program to provide reasonable and prudent alternatives and measures.

6.0 Minor Depletion Allowance

In 1992, the Service instituted a minor depletions account. Between March, 1992 and December, 1998, the Service consulted individually on approximately 58 proposed "minor depletions" that ranged in quantity from 0.02 acre-feet/year (AF/yr) to 500 AF/yr, lasting from a few weeks to perpetuity. No biological opinions were issued under this initial minor depletion account after December, 1998, and the account is now closed to new depletions. On September 21, 1999, the Service issued an "Intra-Service Section 7 Consultation for Minor Depletions of 100 Acre-feet or Less from the San Juan River Basin." This opinion provides for a cumulative total of 3,000 AF/yr of new minor depletions in the Basin. The minor depletion allowance increases the efficiency of and streamlines the section 7 process, benefitting water development and water management activities included in the biological opinions on minor depletions, while protecting the endangered and native fish community.

The following guidelines will be used by the Service in conducting section 7 consultation on new minor depletions under the September 21, 1999 biological opinion:

1. A minor depletion is defined as a depletion of 100 AF/yr or less. However, the Service may use its discretion to allow larger depletions to be included in the minor depletion account based on impacts to listed species and critical habitat.

2. In rendering biological opinions on federal actions resulting in minor depletions, the Service will consider all new information concerning impacts and the status of the listed species and their habitats, and good faith implementation of the Program in determining if the Program can avoid the likelihood of jeopardy and/or destruction or adverse modification or minimize impacts of any incidental take.
3. The Service will maintain a minor depletions account wherein the aggregate of all new minor depletions allowed by the Service through section 7 consultation and under the September 21, 1999 opinion may result in a total annual depletion of not more than 3,000 AF/yr.
4. The Service will review each proposed federal action for consideration under the September 21, 1999 biological opinion and utilize that biological opinion to facilitate consultation so long as a proposed depletion fits within the 3,000 AF/yr ceiling and does not compromise the purposes for which the minor depletion opinion was issued.
5. Once the 3,000 AF/yr limit is reached for new depletions under the September 21, 1999 biological opinion, the Service will assess the effects of further minor depletions on listed species and issue an opinion to cover further minor depletions, if appropriate.
6. Depletions that were in existence as of October 25, 1991, the date of the Animas-La Plata Project biological opinion, are included in the environmental baseline for that opinion and will not be counted against any minor depletions account. The minor depletion accounts are only for new depletions. ESA consultation may still be required for historic depletions occurring prior to October 25, 1991, if those depletions have a federal nexus.

7.0 Reinitiation of Consultation

- A. This section describes the process of reinitiation of consultation on water development and water management activities for which the Program is providing the reasonable and prudent alternative or measure.
- B. As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and one of the following occur:
 1. The amount or extent of taking specified in the incidental take statement is exceeded.

2. New information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered.
 3. The identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion.
 4. A new species is listed or critical habitat designated that may be affected by the identified action.
- C. If it is determined that reinitiation of consultation may be necessary, the Service will provide such information to the Coordination Committee. Program participants will attempt to identify actions that can be implemented to ensure that, in the reinitiated consultation, the Program continues to serve as the reasonable and prudent alternative and measure. If the Program cannot implement actions to serve as the reasonable and prudent alternative and measure, the federal action agency(ies) and/or project sponsor will work with the Service independently of the Program to resolve ESA issues. Compliance with the ESA is ultimately the responsibility of the federal action agency(ies).
- D. If reinitiation is necessary, the following courses of action will be taken, so long as they do not slow or delay reinitiation of consultation:
1. If the amount or extent of taking specified in the incidental take statement is exceeded. The assessment and determination of whether incidental take has been exceeded is a matter of review and discussion between the action agency(ies) and the Service. If additional reasonable and prudent alternatives or measures are needed, the Service will identify the actions needed, and provide the Program with the opportunity to incorporate those actions into the LRP and implement those actions.
 2. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered. In certain situations, recovery actions in the LRP that were utilized as a reasonable and prudent alternative or measure may no longer be effective or appropriate. These situations may include, but are not limited to:
 - a. Critical deadlines for specified recovery actions are missed
 - b. Specified recovery actions are determined to be infeasible; and/or

- c. Significant new information about the needs or population status of the fishes becomes available.

The Service will notify the Coordination Committee when such a situation is foreseeable or actually occurs. If the Coordination Committee becomes aware of such a situation before the Service, they will notify the Service. The Coordination Committee will work with the Service to evaluate the situation and develop the most appropriate response to restore the Program as a reasonable and prudent alternative or measure, such as adjusting the LRP so the action can be achieved, developing a supplemental recovery action for incorporation into the LRP, shortening the time frame on other recovery actions, etc. The determination of the amount and extent of impact to a species and/or critical habitat is strictly a Service responsibility.

If the Program can no longer serve as a reasonable and prudent alternative or measure, the Service will develop a reasonable and prudent alternative or measure, if available, with the federal action agency(ies) and the project sponsor. In this situation, the reasonable and prudent alternative or measure will be consistent with the intended purpose of the action, within the federal agency's legal authority and jurisdiction to implement, and will be economically and technologically feasible.

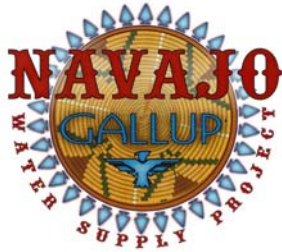
3. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion. If an activity is modified in such a manner so as to require reinitiation of consultation, the Service will identify additional or different action items from the LRP to serve as reasonable and prudent alternatives or measures for the activity where possible.
4. If a new species is listed or critical habitat designated that may be affected by the identified action. The Service will make recommendations to the Coordination Committee for amendments to the Program and LRP to avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat, or to minimize take for any new fish species listed as threatened or endangered. The Program participants will then decide whether to make the amendments. If the amendments are made, the Service will use the amended LRP action items as reasonable and prudent alternatives or measures. If the Program cannot be amended, then consultation will be reinitiated and reasonable and prudent alternatives or measures will be developed with the federal action agency(ies) and project sponsors.

- E. All biological opinions issued will contain language requesting the applicable federal agency(ies) to retain discretion to reinitiate consultation should reinitiation become necessary.

8.0 Modification of Principles

These principles have been adopted by the Coordination Committee. The principles have been reviewed by the Service and found to be consistent with the ESA and applicable regulations and policies. Experience may dictate a need to modify these principles in the future.

A review of these principles may be initiated by any voting member of the Coordination Committee. These principles may be modified or amended by vote of the Program participants, pursuant to normal voting procedures as defined in the “San Juan River Basin Recovery Implementation Program” (Service, 1992), as amended. However, modifications to the principles will be subject to review by the Service to assure continued compliance with the ESA and applicable regulations in conducting section 7 consultations on water development and water management activities in the Basin. Should the Service find that proposed modifications or modifications to these principles are inconsistent with the ESA or applicable regulations or policies, the Service will notify the Coordination Committee in writing, with recommendations for bringing the principles into compliance with the ESA.



ATTACHMENT P

Northwestern New Mexico Rural Water
Projects Act (Public Law 111-11,
title X, subtitle B)

Excerpts from Public Law 111-11

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TITLE X--WATER SETTLEMENTS

Subtitle B--Northwestern New Mexico Rural Water Projects

SEC. 10301. SHORT TITLE.

This subtitle may be cited as the 'Northwestern New Mexico Rural Water Projects Act'.

SEC. 10302. DEFINITIONS.

In this subtitle:

- (1) AAMODT ADJUDICATION- The term 'Aamodt adjudication' means the general stream adjudication that is the subject of the civil action entitled 'State of New Mexico, ex rel. State Engineer and United States of America, Pueblo de Nambe, Pueblo de Pojoaque, Pueblo de San Ildefonso, and Pueblo de Tesuque v. R. Lee Aamodt, et al.', No. 66 CV 6639 MV/LCS (D.N.M.).
- (2) ABEYTA ADJUDICATION- The term 'Abeyta adjudication' means the general stream adjudication that is the subject of the civil actions entitled 'State of New Mexico v. Abeyta and State of New Mexico v. Arrellano', Civil Nos. 7896-BB (D.N.M) and 7939-BB (D.N.M.) (consolidated).
- (3) ACRE-FEET- The term 'acre-feet' means acre-feet per year.
- (4) AGREEMENT- The term 'Agreement' means the agreement among the State of New Mexico, the Nation, and the United States setting forth a stipulated and binding agreement signed by the State of New Mexico and the Nation on April 19, 2005.

- (5) ALLOTTEE- The term `allottee' means a person that holds a beneficial real property interest in a Navajo allotment that--
- (A) is located within the Navajo Reservation or the State of New Mexico;
 - (B) is held in trust by the United States; and
 - (C) was originally granted to an individual member of the Nation by public land order or otherwise.
- (6) ANIMAS-LA PLATA PROJECT- The term `Animas-La Plata Project' has the meaning given the term in section 3 of Public Law 100-585 (102 Stat. 2973), including Ridges Basin Dam, Lake Nighthorse, the Navajo Nation Municipal Pipeline, and any other features or modifications made pursuant to the Colorado Ute Settlement Act Amendments of 2000 (Public Law 106-554; 114 Stat. 2763A-258).
- (7) CITY- The term `City' means the city of Gallup, New Mexico, or a designee of the City, with authority to provide water to the Gallup, New Mexico service area.
- (8) COLORADO RIVER COMPACT- The term `Colorado River Compact' means the Colorado River Compact of 1922 as approved by Congress in the Act of December 21, 1928 (45 Stat. 1057) and by the Presidential Proclamation of June 25, 1929 (46 Stat. 3000).
- (9) COLORADO RIVER SYSTEM- The term `Colorado River System' has the same meaning given the term in Article II(a) of the Colorado River Compact.
- (10) COMPACT- The term `Compact' means the Upper Colorado River Basin Compact as consented to by the Act of April 6, 1949 (63 Stat. 31, chapter 48).
- (11) CONTRACT- The term `Contract' means the contract between the United States and the Nation setting forth certain commitments, rights, and obligations of the United States and the Nation, as described in paragraph 6.0 of the Agreement.
- (12) DEPLETION- The term `depletion' means the depletion of the flow of the San Juan River stream system in the State of New Mexico by a particular use of water (including any depletion incident to the use) and represents the diversion from the stream system by the use, less return flows to the stream system from the use.
- (13) DRAFT IMPACT STATEMENT- The term `Draft Impact Statement' means the draft environmental impact statement prepared by the Bureau of Reclamation for the Project dated March 2007.
- (14) FUND- The term `Fund' means the Reclamation Waters Settlements Fund established by section 10501(a).
- (15) HYDROLOGIC DETERMINATION- The term `hydrologic determination' means the hydrologic determination entitled `Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico,' prepared by the

Bureau of Reclamation pursuant to section 11 of the Act of June 13, 1962 (Public Law 87-483; 76 Stat. 99), and dated May 23, 2007.

(16) LOWER BASIN- The term `Lower Basin' has the same meaning given the term in Article II(g) of the Colorado River Compact.

(17) NATION- The term `Nation' means the Navajo Nation, a body politic and federally-recognized Indian nation as provided for in section 101(2) of the Federally Recognized Indian Tribe List of 1994 (25 U.S.C. 497a(2)), also known variously as the `Navajo Tribe,' the `Navajo Tribe of Arizona, New Mexico & Utah,' and the `Navajo Tribe of Indians' and other similar names, and includes all bands of Navajo Indians and chapters of the Navajo Nation.

(18) NAVAJO-GALLUP WATER SUPPLY PROJECT; PROJECT- The term `Navajo-Gallup Water Supply Project' or `Project' means the Navajo-Gallup Water Supply Project authorized under section 10602(a), as described as the preferred alternative in the Draft Impact Statement.

(19) NAVAJO INDIAN IRRIGATION PROJECT- The term `Navajo Indian Irrigation Project' means the Navajo Indian irrigation project authorized by section 2 of Public Law 87-483 (76 Stat. 96).

(20) NAVAJO RESERVOIR- The term `Navajo Reservoir' means the reservoir created by the impoundment of the San Juan River at Navajo Dam, as authorized by the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') (43 U.S.C. 620 et seq.).

(21) NAVAJO NATION MUNICIPAL PIPELINE; PIPELINE- The term `Navajo Nation Municipal Pipeline' or `Pipeline' means the pipeline used to convey the water of the Animas-La Plata Project of the Navajo Nation from the City of Farmington, New Mexico, to communities of the Navajo Nation located in close proximity to the San Juan River Valley in the State of New Mexico (including the City of Shiprock), as authorized by section 15(b) of the Colorado Ute Indian Water Rights Settlement Act of 1988 (Public Law 100-585; 102 Stat. 2973; 114 Stat. 2763A-263).

(22) NON-NAVAJO IRRIGATION DISTRICTS- The term `Non-Navajo Irrigation Districts' means--

- (A) the Hammond Conservancy District;
- (B) the Bloomfield Irrigation District; and
- (C) any other community ditch organization in the San Juan River basin in the State of New Mexico.

(23) PARTIAL FINAL DECREE- The term `Partial Final Decree' means a final and binding judgment and decree entered by a court in the stream adjudication, setting forth the rights of the Nation to use and administer waters of the San Juan River Basin in New Mexico, as set forth in Appendix 1 of the Agreement.

(24) PROJECT PARTICIPANTS- The term `Project Participants' means the City, the Nation, and the Jicarilla Apache Nation.

(25) SAN JUAN RIVER BASIN RECOVERY IMPLEMENTATION PROGRAM- The term `San Juan River Basin Recovery Implementation Program' means the intergovernmental program established pursuant to the cooperative agreement dated October 21, 1992 (including any amendments to the program).

(26) SECRETARY- The term `Secretary' means the Secretary of the Interior, acting through the Commissioner of Reclamation or any other designee.

(27) STREAM ADJUDICATION- The term `stream adjudication' means the general stream adjudication that is the subject of *New Mexico v. United States, et al.*, No. 75-185 (11th Jud. Dist., San Juan County, New Mexico) (involving claims to waters of the San Juan River and the tributaries of that river).

(28) SUPPLEMENTAL PARTIAL FINAL DECREE- The term `Supplemental Partial Final Decree' means a final and binding judgment and decree entered by a court in the stream adjudication, setting forth certain water rights of the Nation, as set forth in Appendix 2 of the Agreement.

(29) TRUST FUND- The term `Trust Fund' means the Navajo Nation Water Resources Development Trust Fund established by section 10702(a).

(30) UPPER BASIN- The term `Upper Basin' has the same meaning given the term in Article II(f) of the Colorado River Compact.

SEC. 10303. COMPLIANCE WITH ENVIRONMENTAL LAWS.

(a) Effect of Execution of Agreement- The execution of the Agreement under section 10701(a)(2) shall not constitute a major Federal action under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.).

(b) Compliance With Environmental Laws- In carrying out this subtitle, the Secretary shall comply with each law of the Federal Government relating to the protection of the environment, including--

(1) the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.); and

(2) the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.).

SEC. 10304. NO REALLOCATION OF COSTS.

(a) Effect of Act- Notwithstanding any other provision of law, the Secretary shall not reallocate or reassign any costs of projects that have been authorized under the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') (43 U.S.C. 620 et seq.), as of the date of enactment of this Act because of--

(1) the authorization of the Navajo-Gallup Water Supply Project under this subtitle; or

(2) the changes in the uses of the water diverted by the Navajo Indian Irrigation Project or the waters stored in the Navajo Reservoir authorized under this subtitle.

(b) Use of Power Revenues- Notwithstanding any other provision of law, no power revenues under the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') (43 U.S.C. 620 et seq.), shall be used to pay or reimburse any costs of the Navajo Indian Irrigation Project or Navajo-Gallup Water Supply Project.

SEC. 10305. INTEREST RATE.

Notwithstanding any other provision of law, the interest rate applicable to any repayment contract entered into under section 10604 shall be equal to the discount rate for Federal water resources planning, as determined by the Secretary.

PART I--AMENDMENTS TO THE COLORADO RIVER STORAGE PROJECT ACT AND PUBLIC LAW 87-483

SEC. 10401. AMENDMENTS TO THE COLORADO RIVER STORAGE PROJECT ACT.

(a) Participating Projects- Paragraph (2) of the first section of the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') (43 U.S.C. 620(2)) is amended by inserting `the Navajo-Gallup Water Supply Project,' after `Fruitland Mesa,'.

(b) Navajo Reservoir Water Bank- The Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') is amended--

(1) by redesignating section 16 (43 U.S.C. 620o) as section 17; and

(2) by inserting after section 15 (43 U.S.C. 620n) the following:
`Sec. 16. (a) The Secretary of the Interior may create and operate within the available capacity of Navajo Reservoir a top water bank.

`(b) Water made available for the top water bank in accordance with subsections (c) and (d) shall not be subject to section 11 of Public Law 87-483 (76 Stat. 99).

`(c) The top water bank authorized under subsection (a) shall be operated in a manner that--

`(1) is consistent with applicable law, except that, notwithstanding any other provision of law, water for purposes other than irrigation may be stored in the Navajo Reservoir pursuant to the rules governing the top water bank established under this section; and

`(2) does not impair the ability of the Secretary of the Interior to deliver water under contracts entered into under--

`(A) Public Law 87-483 (76 Stat. 96); and

`(B) New Mexico State Engineer File Nos. 2847, 2848, 2849, and 2917.

`(d)(1) The Secretary of the Interior, in cooperation with the State of New Mexico (acting through the Interstate Stream Commission), shall develop any terms and procedures for the storage, accounting, and

release of water in the top water bank that are necessary to comply with subsection (c).

` (2) The terms and procedures developed under paragraph (1) shall include provisions requiring that--

` (A) the storage of banked water shall be subject to approval under State law by the New Mexico State Engineer to ensure that impairment of any existing water right does not occur, including storage of water under New Mexico State Engineer File No. 2849;

` (B) water in the top water bank be subject to evaporation and other losses during storage;

` (C) water in the top water bank be released for delivery to the owner or assigns of the banked water on request of the owner, subject to reasonable scheduling requirements for making the release;

` (D) water in the top water bank be the first water spilled or released for flood control purposes in anticipation of a spill, on the condition that top water bank water shall not be released or included for purposes of calculating whether a release should occur for purposes of satisfying the flow recommendations of the San Juan River Basin Recovery Implementation Program; and

` (E) water eligible for banking in the top water bank shall be water that otherwise would have been diverted and beneficially used in New Mexico that year.

` (e) The Secretary of the Interior may charge fees to water users that use the top water bank in amounts sufficient to cover the costs incurred by the United States in administering the water bank.'

SEC. 10402. AMENDMENTS TO PUBLIC LAW 87-483.

(a) Navajo Indian Irrigation Project- Public Law 87-483 (76 Stat. 96) is amended by striking section 2 and inserting the following:

` Sec. 2. (a) In accordance with the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') (43 U.S.C. 620 et seq.), the Secretary of the Interior is authorized to construct, operate, and maintain the Navajo Indian Irrigation Project to provide irrigation water to a service area of not more than 110,630 acres of land.

` (b)(1) Subject to paragraph (2), the average annual diversion by the Navajo Indian Irrigation Project from the Navajo Reservoir over any consecutive 10-year period shall be the lesser of--

` (A) 508,000 acre-feet per year; or

` (B) the quantity of water necessary to supply an average depletion of 270,000 acre-feet per year.

` (2) The quantity of water diverted for any 1 year shall not exceed the average annual diversion determined under paragraph (1) by more than 15 percent.

` (c) In addition to being used for irrigation, the water diverted by the Navajo Indian Irrigation Project under subsection (b) may be used

within the area served by Navajo Indian Irrigation Project facilities for the following purposes:

- ˆ (1) Aquaculture purposes, including the rearing of fish in support of the San Juan River Basin Recovery Implementation Program authorized by Public Law 106-392 (114 Stat. 1602).
- ˆ (2) Domestic, industrial, or commercial purposes relating to agricultural production and processing.
- ˆ (3)(A) The generation of hydroelectric power as an incident to the diversion of water by the Navajo Indian Irrigation Project for authorized purposes.
- ˆ (B) Notwithstanding any other provision of law--
 - ˆ (i) any hydroelectric power generated under this paragraph shall be used or marketed by the Navajo Nation;
 - ˆ (ii) the Navajo Nation shall retain any revenues from the sale of the hydroelectric power; and
 - ˆ (iii) the United States shall have no trust obligation to monitor, administer, or account for the revenues received by the Navajo Nation, or the expenditure of the revenues.
- ˆ (4) The implementation of the alternate water source provisions described in subparagraph 9.2 of the agreement executed under section 10701(a)(2) of the Northwestern New Mexico Rural Water Projects Act.
- ˆ (d) The Navajo Indian Irrigation Project water diverted under subsection (b) may be transferred to areas located within or outside the area served by Navajo Indian Irrigation Project facilities, and within or outside the boundaries of the Navajo Nation, for any beneficial use in accordance with--
 - ˆ (1) the agreement executed under section 10701(a)(2) of the Northwestern New Mexico Rural Water Projects Act;
 - ˆ (2) the contract executed under section 10604(a)(2)(B) of that Act; and
 - ˆ (3) any other applicable law.
- ˆ (e) The Secretary may use the capacity of the Navajo Indian Irrigation Project works to convey water supplies for--
 - ˆ (1) the Navajo-Gallup Water Supply Project under section 10602 of the Northwestern New Mexico Rural Water Projects Act; or
 - ˆ (2) other nonirrigation purposes authorized under subsection (c) or (d).
- ˆ (f)(1) Repayment of the costs of construction of the project (as authorized in subsection (a)) shall be in accordance with the Act of April 11, 1956 (commonly known as the 'Colorado River Storage Project Act') (43 U.S.C. 620 et seq.), including section 4(d) of that Act.
- ˆ (2) The Secretary shall not reallocate, or require repayment of, construction costs of the Navajo Indian Irrigation Project because of the conveyance of water supplies for nonirrigation purposes under subsection (e).'

(b) Runoff Above Navajo Dam- Section 11 of Public Law 87-483 (76 Stat. 100) is amended by adding at the end the following:

` (d)(1) For purposes of implementing in a year of prospective shortage the water allocation procedures established by subsection (a), the Secretary of the Interior shall determine the quantity of any shortages and the appropriate apportionment of water using the normal diversion requirements on the flow of the San Juan River originating above Navajo Dam based on the following criteria:

` (A) The quantity of diversion or water delivery for the current year anticipated to be necessary to irrigate land in accordance with cropping plans prepared by contractors.

` (B) The annual diversion or water delivery demands for the current year anticipated for non-irrigation uses under water delivery contracts, including contracts authorized by the Northwestern New Mexico Rural Water Projects Act, but excluding any current demand for surface water for placement into aquifer storage for future recovery and use.

` (C) An annual normal diversion demand of 135,000 acre-feet for the initial stage of the San Juan-Chama Project authorized by section 8, which shall be the amount to which any shortage is applied.

` (2) The Secretary shall not include in the normal diversion requirements--

` (A) the quantity of water that reliably can be anticipated to be diverted or delivered under a contract from inflows to the San Juan River arising below Navajo Dam under New Mexico State Engineer File No. 3215; or

` (B) the quantity of water anticipated to be supplied through reuse.

` (e)(1) If the Secretary determines that there is a shortage of water under subsection (a), the Secretary shall respond to the shortage in the Navajo Reservoir water supply by curtailing releases and deliveries in the following order:

` (A) The demand for delivery for uses in the State of Arizona under the Navajo-Gallup Water Supply Project authorized by section 10603 of the Northwestern New Mexico Rural Water Projects Act, excluding the quantity of water anticipated to be diverted for the uses from inflows to the San Juan River that arise below Navajo Dam in accordance with New Mexico State Engineer File No. 3215.

` (B) The demand for delivery for uses allocated under paragraph 8.2 of the agreement executed under section 10701(a)(2) of the Northwestern New Mexico Rural Water Projects Act, excluding the quantity of water anticipated to be diverted for such uses under State Engineer File No. 3215.

` (C) The uses in the State of New Mexico that are determined under subsection (d), in accordance with the procedure for apportioning the water supply under subsection (a).

` (2) For any year for which the Secretary determines and responds to a shortage in the Navajo Reservoir water supply, the Secretary shall not deliver, and contractors of the water supply shall not divert, any of the water supply for placement into aquifer storage for future recovery and use.

` (3) To determine the occurrence and amount of any shortage to contracts entered into under this section, the Secretary shall not include as available storage any water stored in a top water bank in Navajo Reservoir established under section 16(a) of the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act').

` (f) The Secretary of the Interior shall apportion water under subsections (a), (d), and (e) on an annual volume basis.

` (g) The Secretary of the Interior may revise a determination of shortages, apportionments, or allocations of water under subsections (a), (d), and (e) on the basis of information relating to water supply conditions that was not available at the time at which the determination was made.

` (h) Nothing in this section prohibits the distribution of water in accordance with cooperative water agreements between water users providing for a sharing of water supplies.

` (i) Diversions under New Mexico State Engineer File No. 3215 shall be distributed, to the maximum extent water is available, in proportionate amounts to the diversion demands of contractors and subcontractors of the Navajo Reservoir water supply that are diverting water below Navajo Dam.'.

SEC. 10403. EFFECT ON FEDERAL WATER LAW.

Unless expressly provided in this subtitle, nothing in this subtitle modifies, conflicts with, preempts, or otherwise affects--

- (1) the Boulder Canyon Project Act (43 U.S.C. 617 et seq.);
- (2) the Boulder Canyon Project Adjustment Act (54 Stat. 774, chapter 643);
- (3) the Act of April 11, 1956 (commonly known as the `Colorado River Storage Project Act') (43 U.S.C. 620 et seq.);
- (4) the Act of September 30, 1968 (commonly known as the `Colorado River Basin Project Act') (82 Stat. 885);
- (5) Public Law 87-483 (76 Stat. 96);
- (6) the Treaty between the United States of America and Mexico respecting utilization of waters of the Colorado and Tijuana Rivers and of the Rio Grande, signed at Washington February 3, 1944 (59 Stat. 1219);
- (7) the Colorado River Compact of 1922, as approved by the Presidential Proclamation of June 25, 1929 (46 Stat. 3000);
- (8) the Compact;
- (9) the Act of April 6, 1949 (63 Stat. 31, chapter 48);
- (10) the Jicarilla Apache Tribe Water Rights Settlement Act (106 Stat. 2237); or

(11) section 205 of the Energy and Water Development Appropriations Act, 2005 (118 Stat. 2949).

PART II--RECLAMATION WATER SETTLEMENTS FUND

SEC. 10501. RECLAMATION WATER SETTLEMENTS FUND.

- (a) Establishment- There is established in the Treasury of the United States a fund, to be known as the 'Reclamation Water Settlements Fund', consisting of--
- (1) such amounts as are deposited to the Fund under subsection (b); and
 - (2) any interest earned on investment of amounts in the Fund under subsection (d).
- (b) Deposits to Fund-
- (1) **IN GENERAL-** For each of fiscal years **2020 through 2029, the Secretary of the Treasury shall deposit in the Fund, if available, \$120,000,000 of the revenues** that would otherwise be deposited for the fiscal year in the fund established by the first section of the Act of June 17, 1902 (32 Stat. 388, chapter 1093).
 - (2) **AVAILABILITY OF AMOUNTS-** Amounts deposited in the Fund under paragraph (1) shall be made available pursuant to this section--
 - (A) **without further appropriation;** and
 - (B) in addition to amounts appropriated pursuant to any authorization contained in any other provision of law.
- (c) Expenditures From Fund-
- (1) **IN GENERAL-**
 - (A) **EXPENDITURES-** Subject to subparagraph (B), for each of fiscal years 2020 through 2034, the Secretary may expend from the Fund an amount not to exceed \$120,000,000, plus the interest accrued in the Fund, for the fiscal year in which expenditures are made pursuant to paragraphs (2) and (3).
 - (B) **ADDITIONAL EXPENDITURES-** The Secretary may expend more than \$120,000,000 for any fiscal year if such amounts are available in the Fund due to expenditures not reaching \$120,000,000 for prior fiscal years.
 - (2) **AUTHORITY-** The Secretary may expend money from the Fund to implement a settlement agreement approved by Congress that resolves, in whole or in part, litigation involving the United States, if the settlement agreement or implementing legislation requires the Bureau of Reclamation to provide financial assistance for, or plan, design, and construct--
 - (A) water supply infrastructure; or

(B) a project--

- (i) to rehabilitate a water delivery system to conserve water; or
- (ii) to restore fish and wildlife habitat or otherwise improve environmental conditions associated with or affected by, or located within the same river basin as, a Federal reclamation project that is in existence on the date of enactment of this Act.

(3) USE FOR COMPLETION OF PROJECT AND OTHER SETTLEMENTS-

(A) PRIORITIES-

(i) FIRST PRIORITY-

(I) IN GENERAL- The first priority for expenditure of amounts in the Fund during the entire period in which the Fund is in existence shall be for the purposes described in, and in the order of, clauses (i) through (iv) of subparagraph (B).

(II) RESERVED AMOUNTS- The Secretary shall reserve and use amounts deposited into the Fund in accordance with subclause (I).

(ii) OTHER PURPOSES- Any amounts in the Fund that are not needed for the purposes described in subparagraph (B) may be used for other purposes authorized in paragraph (2).

(B) COMPLETION OF PROJECT-

(i) NAVAJO-GALLUP WATER SUPPLY PROJECT-

(I) IN GENERAL- Subject to subclause (II), effective beginning January 1, 2020, if, in the judgment of the Secretary on an annual basis the deadline described in section 10701(e)(1)(A)(ix) is unlikely to be met because a sufficient amount of funding is not otherwise available through appropriations made available pursuant to section 10609(a), the Secretary shall expend from the Fund such amounts on an annual basis consistent with paragraphs (1) and (2), as are necessary to pay the Federal share of the costs, and substantially complete as expeditiously as practicable, the construction of the water supply infrastructure authorized as part of the Project.

(II) MAXIMUM AMOUNT-

(aa) IN GENERAL- Except as provided under item (bb), the amount expended under subclause (I) shall not exceed **\$500,000,000 for the period of fiscal years 2020 through 2029.**

(bb) EXCEPTION- The limitation on the expenditure amount under item (aa) may be exceeded during the entire period in which the Fund is in existence if such additional funds can be expended without limiting the amounts identified in clauses (ii) through (iv).

(ii) OTHER NEW MEXICO SETTLEMENTS-

(I) IN GENERAL- Subject to subclause (II), effective beginning January 1, 2020, in addition to the funding made available under clause (i), if in the judgment of the Secretary on an annual basis a sufficient amount of funding is not otherwise available through annual appropriations, the **Secretary shall expend from the Fund** such amounts on an annual basis consistent with paragraphs (1) and (2), as are necessary to pay the Federal share of the remaining costs of implementing the Indian water rights settlement agreements entered into by the State of New Mexico in the **Aamodt** adjudication and the **Abeyta** adjudication, if such settlements are subsequently approved and authorized by an Act of Congress and the implementation period has not already expired.

(II) MAXIMUM AMOUNT- The amount expended under subclause (I) shall not exceed \$250,000,000.

(iii) MONTANA SETTLEMENTS-

(I) IN GENERAL- Subject to subclause (II), effective beginning January 1, 2020, in addition to funding made available pursuant to clauses (i) and (ii), if in the judgment of the Secretary on an annual basis a sufficient amount of funding is not otherwise available through annual appropriations, the Secretary shall expend from the Fund such amounts on an annual basis consistent with paragraphs (1) and (2), as are necessary to pay the Federal share of the remaining costs of implementing Indian water rights settlement agreements entered into by the State of Montana with the Blackfeet Tribe, the Crow Tribe, or the Gros Ventre and Assiniboine Tribes of the Fort Belknap Indian Reservation in the judicial proceeding entitled `In re the General Adjudication of All the Rights to Use Surface and Groundwater in the State of

Montana', if a settlement or settlements are subsequently approved and authorized by an Act of Congress and the implementation period has not already expired.

(II) MAXIMUM AMOUNT-

(aa) IN GENERAL- Except as provided under item (bb), the amount expended under subclause (I) shall not exceed \$350,000,000 for the period of fiscal years 2020 through 2029.

(bb) EXCEPTION- The limitation on the expenditure amount under item (aa) may be exceeded during the entire period in which the Fund is in existence if such additional funds can be expended without limiting the amounts identified in clause (i), (ii), and (iv).

(cc) OTHER FUNDING- The Secretary shall ensure that any funding under this clause shall be provided in a manner that does not limit the funding available pursuant to clauses (i) and (ii).

(iv) ARIZONA SETTLEMENT-

(I) IN GENERAL- Subject to subclause (II), effective beginning January 1, 2020, in addition to funding made available pursuant to clauses (i), (ii), and (iii), if in the judgment of the Secretary on an annual basis a sufficient amount of funding is not otherwise available through annual appropriations, the Secretary shall expend from the Fund such amounts on an annual basis consistent with paragraphs (1) and (2), as are necessary to pay the Federal share of the remaining costs of implementing an Indian water rights settlement agreement entered into by the State of Arizona with the Navajo Nation to resolve the water rights claims of the Nation in the Lower Colorado River basin in Arizona, if a settlement is subsequently approved and authorized by an Act of Congress and the implementation period has not already expired.

(II) MAXIMUM AMOUNT-

(aa) IN GENERAL- Except as provided under item (bb), the amount expended under subclause (I) shall not exceed \$100,000,000 for the period of fiscal years 2020 through 2029.

(bb) EXCEPTION- The limitation on the expenditure amount under item (aa) may be exceeded during the entire period in which the Fund is in existence if

such additional funds can be expended without limiting the amounts identified in clauses (i) through (iii).

(cc) OTHER FUNDING- The Secretary shall ensure that any funding under this clause shall be provided in a manner that does not limit the funding available pursuant to clauses (i) and (ii).

(C) REVERSION- If the settlements described in clauses (ii) through (iv) of subparagraph (B) have not been approved and authorized by an Act of Congress by December 31, 2019, the amounts reserved for the settlements shall no longer be reserved by the Secretary pursuant to subparagraph (A)(i) and shall revert to the Fund for any authorized use, as determined by the Secretary.

(d) Investment of Amounts-

(1) IN GENERAL- The Secretary shall invest such portion of the Fund as is not, in the judgment of the Secretary, required to meet current withdrawals.

(2) CREDITS TO FUND- The interest on, and the proceeds from the sale or redemption of, any obligations held in the Fund shall be credited to, and form a part of, the Fund.

(e) Transfers of Amounts-

(1) IN GENERAL- The amounts required to be transferred to the Fund under this section shall be transferred at least monthly from the general fund of the Treasury to the Fund on the basis of estimates made by the Secretary of the Treasury.

(2) ADJUSTMENTS- Proper adjustment shall be made in amounts subsequently transferred to the extent prior estimates were in excess of or less than the amounts required to be transferred.

(f) Termination- On September 30, 2034--

(1) the Fund shall terminate; and

(2) the unexpended and unobligated balance of the Fund shall be transferred to the appropriate fund of the Treasury.

PART III--NAVAJO-GALLUP WATER SUPPLY PROJECT

SEC. 10601. PURPOSES.

The purposes of this part are--

(1) to authorize the Secretary to construct, operate, and maintain the Navajo-Gallup Water Supply Project;

(2) to allocate the capacity of the Project among the Nation, the City, and the Jicarilla Apache Nation; and

(3) to authorize the Secretary to enter into Project repayment contracts with the City and the Jicarilla Apache Nation.

SEC. 10602. AUTHORIZATION OF NAVAJO-GALLUP WATER SUPPLY PROJECT.

(a) In General- The Secretary, acting through the Commissioner of Reclamation, is authorized to design, construct, operate, and maintain the Project in substantial accordance with the preferred alternative in the Draft Impact Statement.

(b) Project Facilities- To provide for the delivery of San Juan River water to Project Participants, the Secretary may construct, operate, and maintain the Project facilities described in the preferred alternative in the Draft Impact Statement, including:

(1) A pumping plant on the San Juan River in the vicinity of Kirtland, New Mexico.

(2)(A) A main pipeline from the San Juan River near Kirtland, New Mexico, to Shiprock, New Mexico, and Gallup, New Mexico, which follows United States Highway 491.

(B) Any pumping plants associated with the pipeline authorized under subparagraph (A).

(3)(A) A main pipeline from Cutter Reservoir to Ojo Encino, New Mexico, which follows United States Highway 550.

(B) Any pumping plants associated with the pipeline authorized under subparagraph (A).

(4)(A) Lateral pipelines from the main pipelines to Nation communities in the States of New Mexico and Arizona.

(B) Any pumping plants associated with the pipelines authorized under subparagraph (A).

(5) Any water regulation, storage or treatment facility, service connection to an existing public water supply system, power substation, power distribution works, or other appurtenant works (including a building or access road) that is related to the Project facilities authorized by paragraphs (1) through (4), including power transmission facilities and associated wheeling services to connect Project facilities to existing high-voltage transmission facilities and deliver power to the Project.

(c) Acquisition of Land-

(1) IN GENERAL- The Secretary is authorized to acquire any land or interest in land that is necessary to construct, operate, and maintain the Project facilities authorized under subsection (b).

(2) LAND OF THE PROJECT PARTICIPANTS- As a condition of construction of the facilities authorized under this part, the Project Participants shall provide all land or interest in land, as appropriate, that the Secretary identifies as necessary for acquisition under this subsection at no cost to the Secretary.

(3) LIMITATION- The Secretary may not condemn water rights for purposes of the Project.

(d) Conditions-

(1) IN GENERAL- Except as provided in paragraph (2), the Secretary shall not commence construction of the facilities authorized under subsection (b) until such time as--

(A) the Secretary executes the Agreement and the Contract;

(B) the contracts authorized under section 10604 are executed;

(C) the Secretary--

(i) completes an environmental impact statement for the Project; and

(ii) has issued a record of decision that provides for a preferred alternative; and

(D) the Secretary has entered into an agreement with the State of New Mexico under which the **State of New Mexico will provide a share of the construction costs of the Project of not less than \$50,000,000**, except that the State of New Mexico shall receive credit for funds the State has contributed to construct water conveyance facilities to the Project Participants to the extent that the facilities reduce the cost of the Project as estimated in the Draft Impact Statement.

(2) EXCEPTION- If the Jicarilla Apache Nation elects not to enter into a contract pursuant to section 10604, the Secretary, after consulting with the Nation, the City, and the State of New Mexico acting through the Interstate Stream Commission, may make appropriate modifications to the scope of the Project and proceed with Project construction if all other conditions for construction have been satisfied.

(3) EFFECT OF INDIAN SELF-DETERMINATION AND EDUCATION ASSISTANCE ACT- The Indian Self-Determination and Education Assistance Act (25 U.S.C. 450 et seq.) **shall not apply** to the design, construction, operation, maintenance, or replacement of the Project.

(e) Power- The Secretary shall reserve, from existing reservations of Colorado River Storage Project power for Bureau of Reclamation projects, up to 26 megawatts of power for use by the Project.

(f) Conveyance of Title to Project Facilities-

(1) IN GENERAL- The Secretary is authorized to enter into separate agreements with the City and the Nation and, on entering into the agreements, shall convey title to each Project facility or section of a Project facility authorized under subsection (b) (including any appropriate interests in land) to the City and the Nation after--

(A) completion of construction of a Project facility or a section of a Project facility that is operating and delivering water; and

(B) execution of a Project operations agreement approved by the Secretary and the Project Participants that sets forth--

(i) any terms and conditions that the Secretary determines are necessary--

(I) to ensure the continuation of the intended benefits of the Project; and

(II) to fulfill the purposes of this part;

(ii) requirements acceptable to the Secretary and the Project Participants for--

(I) the distribution of water under the Project or section of a Project facility; and

(II) the allocation and payment of annual operation, maintenance, and replacement costs of the Project or section of a Project facility based on the proportionate uses of Project facilities; and

(iii) conditions and requirements acceptable to the Secretary and the Project Participants for operating and maintaining each Project facility on completion of the conveyance of title, including the requirement that the City and the Nation shall--

(I) comply with--

(aa) the Compact; and

(bb) other applicable law; and

(II) be responsible for--

(aa) the operation, maintenance, and replacement of each Project facility; and

(bb) the accounting and management of water conveyance and Project finances, as necessary to administer and fulfill the conditions of the Contract executed under section 10604(a)(2)(B).

(2) EFFECT OF CONVEYANCE- The conveyance of title to each Project facility shall not affect the application of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) relating to the use of the water associated with the Project.

(3) LIABILITY-

(A) IN GENERAL- Effective on the date of the conveyance authorized by this subsection, the United States shall not be held liable by any court for damages of any kind arising out of any act, omission, or occurrence relating to the land, buildings, or facilities conveyed under this subsection, other than damages caused by acts of

negligence committed by the United States, or by employees or agents of the United States, prior to the date of conveyance.

(B) TORT CLAIMS- Nothing in this section increases the liability of the United States beyond the liability provided in chapter 171 of title 28, United States Code (commonly known as the `Federal Tort Claims Act').

(4) NOTICE OF PROPOSED CONVEYANCE- Not later than 45 days before the date of a proposed conveyance of title to any Project facility, the Secretary shall submit to the Committee on Resources of the House of Representatives and to the Committee on Energy and Natural Resources of the Senate notice of the conveyance of each Project facility.

(g) Colorado River Storage Project Power- The conveyance of Project facilities under subsection (f) shall not affect the availability of Colorado River Storage Project power to the Project under subsection (e).

(h) Regional Use of Project Facilities-

(1) IN GENERAL- Subject to paragraph (2), Project facilities constructed under subsection (b) may be used to treat and convey non-Project water or water that is not allocated by subsection 10603(b) if--

(A) capacity is available without impairing any water delivery to a Project Participant; and

(B) the unallocated or non-Project water beneficiary--

(i) has the right to use the water;

(ii) agrees to pay the operation, maintenance, and replacement costs assignable to the beneficiary for the use of the Project facilities; and

(iii) agrees to pay an appropriate fee that may be established by the Secretary to assist in the recovery of any capital cost allocable to that use.

(2) EFFECT OF PAYMENTS- Any payments to the United States or the Nation for the use of unused capacity under this subsection or for water under any subcontract with the Nation or the Jicarilla Apache Nation shall not alter the construction repayment requirements or the operation, maintenance, and replacement payment requirements of the Project Participants.

SEC. 10603. DELIVERY AND USE OF NAVAJO-GALLUP WATER SUPPLY PROJECT WATER.

(a) Use of Project Water-

(1) IN GENERAL- In accordance with this subtitle and other applicable law, water supply from the Project shall be used for municipal, industrial, commercial, domestic, and stock watering purposes.

(2) USE ON CERTAIN LAND-

(A) IN GENERAL- Subject to subparagraph (B), the Nation may use Project water allocations on--

(i) land held by the United States in trust for the Nation and members of the Nation; and

(ii) land held in fee by the Nation.

(B) TRANSFER- The Nation may transfer the purposes and places of use of the allocated water in accordance with the Agreement and applicable law.

(3) HYDROELECTRIC POWER-

(A) IN GENERAL- Hydroelectric power may be generated as an incident to the delivery of Project water for authorized purposes under paragraph (1).

(B) ADMINISTRATION- Notwithstanding any other provision of law--

(i) any hydroelectric power generated under this paragraph shall be used or marketed by the Nation;

(ii) the Nation shall retain any revenues from the sale of the hydroelectric power; and

(iii) the United States shall have no trust obligation or other obligation to monitor, administer, or account for the revenues received by the Nation, or the expenditure of the revenues.

(4) STORAGE-

(A) IN GENERAL- Subject to subparagraph (B), any water contracted for delivery under paragraph (1) that is not needed for current water demands or uses may be delivered by the Project for placement in underground storage in the State of New Mexico for future recovery and use.

(B) STATE APPROVAL- Delivery of water under subparagraph (A) is subject to--

(i) approval by the State of New Mexico under applicable provisions of State law relating to aquifer storage and recovery; and

(ii) the provisions of the Agreement and this subtitle.

(b) Project Water and Capacity Allocations-

(1) DIVERSION- Subject to availability and consistent with Federal and State law, the Project may divert from the Navajo Reservoir and the San Juan River a quantity of water to be allocated and used consistent with the Agreement and this subtitle, that does not exceed in any 1 year, the lesser of--

(A) **37,760 acre-feet of water; or**

(B) the quantity of water necessary to supply a depletion from the San Juan River of 35,890 acre-feet.

(2) PROJECT DELIVERY CAPACITY ALLOCATIONS-

(A) IN GENERAL- The capacity of the Project shall be allocated to the Project Participants in accordance with

subparagraphs (B) through (E), other provisions of this subtitle, and other applicable law.

(B) DELIVERY CAPACITY ALLOCATION TO THE CITY- The Project may deliver at the point of diversion from the San Juan River not more than **7,500 acre-feet** of water in any 1 year for which the City has secured rights for the use of the City.

(C) DELIVERY CAPACITY ALLOCATION TO NAVAJO NATION COMMUNITIES IN NEW MEXICO- For use by the Nation in the State of New Mexico, the Project may deliver water out of the water rights held by the Secretary for the Nation and confirmed under this subtitle, at the points of diversion from the San Juan River or at Navajo Reservoir in any 1 year, the lesser of--

- (i) **22,650 acre-feet of water**; or
- (ii) the quantity of water necessary to supply a depletion from the San Juan River of **20,780 acre-feet** of water.

(D) DELIVERY CAPACITY ALLOCATION TO NAVAJO NATION COMMUNITIES IN ARIZONA- Subject to subsection (c), the Project may deliver at the point of diversion from the San Juan River not more than **6,411 acre-feet** of water in any 1 year for use by the Nation in the State of Arizona.

(E) DELIVERY CAPACITY ALLOCATION TO JICARILLA APACHE NATION- The Project may deliver at Navajo Reservoir not more than **1,200 acre-feet** of water in any 1 year of the water rights of the Jicarilla Apache Nation, held by the Secretary and confirmed by the Jicarilla Apache Tribe Water Rights Settlement Act (Public Law 102-441; 106 Stat. 2237), for use by the Jicarilla Apache Nation in the southern portion of the Jicarilla Apache Nation Reservation in the State of New Mexico.

(3) USE IN EXCESS OF DELIVERY CAPACITY ALLOCATION QUANTITY- Notwithstanding each delivery capacity allocation quantity limit described in subparagraphs (B), (C), and (E) of paragraph (2), the Secretary may authorize a Project Participant to exceed the delivery capacity allocation quantity limit of that Project Participant if--

- (A) delivery capacity is available without impairing any water delivery to any other Project Participant; and
- (B) the Project Participant benefitting from the increased allocation of delivery capacity--
 - (i) has the right under applicable law to use the additional water;
 - (ii) agrees to pay the operation, maintenance, and replacement costs relating to the additional use of any Project facility; and

(iii) agrees, if the Project title is held by the Secretary, to pay a fee established by the Secretary to assist in recovering capital costs relating to that additional use.

(c) Conditions for Use in Arizona-

(1) REQUIREMENTS- Project water shall not be delivered for use by any community of the Nation located in the State of Arizona under subsection (b)(2)(D) until--

(A) the Nation and the State of Arizona have entered into a water rights settlement agreement approved by an Act of Congress that settles and waives the Nation's claims to water in the Lower Basin and the Little Colorado River Basin in the State of Arizona, including those of the United States on the Nation's behalf; and

(B) the Secretary and the Navajo Nation have entered into a Navajo Reservoir water supply delivery contract for the physical delivery and diversion of water via the Project from the San Juan River system to supply uses in the State of Arizona.

(2) ACCOUNTING OF USES IN ARIZONA-

(A) IN GENERAL- Pursuant to paragraph (1) and notwithstanding any other provision of law, water may be diverted by the Project from the San Juan River in the State of New Mexico in accordance with an appropriate permit issued under New Mexico law for use in the State of Arizona within the Navajo Reservation in the Lower Basin; provided that any depletion of water that results from the diversion of water by the Project from the San Juan River in the State of New Mexico for uses within the State of Arizona (including depletion incidental to the diversion, impounding, or conveyance of water in the State of New Mexico for uses in the State of Arizona) shall be administered and accounted for as either--

- (i) a part of, and charged against, the available consumptive use apportionment made to the State of Arizona by Article III(a) of the Compact and to the Upper Basin by Article III(a) of the Colorado River Compact, in which case any water so diverted by the Project into the Lower Basin for use within the State of Arizona shall not be credited as water reaching Lee Ferry pursuant to Article III(c) and III(d) of the Colorado River Compact; or
- (ii) subject to subparagraph (B), a part of, and charged against, the consumptive use apportionment made to the Lower Basin by Article III(a) of the Colorado River Compact, in which case it shall--

(I) be a part of the Colorado River water that is apportioned to the State of Arizona in Article II(B) of the Consolidated Decree of the Supreme Court of the United States in Arizona v. California (547 U.S. 150) (as may be amended or supplemented);
(II) be credited as water reaching Lee Ferry pursuant to Article III(c) and III(d) of the Colorado River Compact; and
(III) be accounted as the water identified in section 104(a)(1)(B)(ii) of the Arizona Water Settlements Act, (118 Stat. 3478).

(B) LIMITATION- Notwithstanding subparagraph (A)(ii), no water diverted by the Project shall be accounted for pursuant to subparagraph (A)(ii) until such time that--
(i) the Secretary has developed and, as necessary and appropriate, modified, in consultation with the Upper Colorado River Commission and the Governors' Representatives on Colorado River Operations from each State signatory to the Colorado River Compact, all operational and decisional criteria, policies, contracts, guidelines or other documents that control the operations of the Colorado River System reservoirs and diversion works, so as to adjust, account for, and offset the diversion of water apportioned to the State of Arizona, pursuant to the Boulder Canyon Project Act (43 U.S.C. 617 et seq.), from a point of diversion on the San Juan River in New Mexico; provided that all such modifications shall be consistent with the provisions of this Section, and the modifications made pursuant to this clause shall be applicable only for the duration of any such diversions pursuant to section 10603(c)(2)(A)(ii); and
(ii) Article II(B) of the Decree of the Supreme Court of the United States in Arizona v. California (547 U.S. 150 as may be amended or supplemented) is administered so that diversions from the main stream for the Central Arizona Project, as served under existing contracts with the United States by diversion works heretofore constructed, shall be limited and reduced to offset any diversions made pursuant to section 10603(c)(2)(A)(ii) of this Act. This clause shall not affect, in any manner, the amount of water apportioned to Arizona pursuant to the Boulder Canyon Project Act (43 U.S.C. 617 et seq.), or

amend any provisions of said decree or the Colorado River Basin Project Act (43 U.S.C. 1501 et. seq.).

(3) UPPER BASIN PROTECTIONS-

(A) CONSULTATIONS- Henceforth, in any consultation pursuant to 16 U.S.C. 1536(a) with respect to water development in the San Juan River Basin, the Secretary shall confer with the States of Colorado and New Mexico, consistent with the provisions of section 5 of the 'Principles for Conducting Endangered Species Act Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin' as adopted by the Coordination Committee, San Juan River Basin Recovery Implementation Program, on June 19, 2001, and as may be amended or modified.

(B) PRESERVATION OF EXISTING RIGHTS- Rights to the consumptive use of water available to the Upper Basin from the Colorado River System under the Colorado River Compact and the Compact shall not be reduced or prejudiced by any use of water pursuant to subsection 10603(c). Nothing in this Act shall be construed so as to impair, conflict with, or otherwise change the duties and powers of the Upper Colorado River Commission.

(d) Forbearance-

(1) IN GENERAL- Subject to paragraphs (2) and (3), during any year in which a shortage to the normal diversion requirement for any use relating to the Project within the State of Arizona occurs (as determined under section 11 of Public Law 87-483 (76 Stat. 99)), the Nation may temporarily forbear the delivery of the water supply of the Navajo Reservoir for uses in the State of New Mexico under the apportionments of water to the Navajo Indian Irrigation Project and the normal diversion requirements of the Project to allow an equivalent quantity of water to be delivered from the Navajo Reservoir water supply for municipal and domestic uses of the Nation in the State of Arizona under the Project.

(2) LIMITATION OF FORBEARANCE- The Nation may forebear the delivery of water under paragraph (1) of a quantity not exceeding the quantity of the shortage to the normal diversion requirement for any use relating to the Project within the State of Arizona.

(3) EFFECT- The forbearance of the delivery of water under paragraph (1) shall be subject to the requirements in subsection (c).

(e) Effect- Nothing in this subtitle--

(1) authorizes the marketing, leasing, or transfer of the water supplies made available to the Nation under the Contract to

- non-Navajo water users in States other than the State of New Mexico; or
- (2) authorizes the forbearance of water uses in the State of New Mexico to allow uses of water in other States other than as authorized under subsection (d).
- (f) Colorado River Compacts- Notwithstanding any other provision of law--
- (1) water may be diverted by the Project from the San Juan River in the State of New Mexico for use within New Mexico in the lower basin, as that term is used in the Colorado River Compact;
- (2) any water diverted under paragraph (1) shall be a part of, and charged against, the consumptive use apportionment made to the State of New Mexico by Article III(a) of the Compact and to the upper basin by Article III(a) of the Colorado River Compact; and
- (3) any water so diverted by the Project into the lower basin within the State of New Mexico shall not be credited as water reaching Lee Ferry pursuant to Articles III(c) and III(d) of the Colorado River Compact.
- (g) Payment of Operation, Maintenance, and Replacement Costs-
- (1) IN GENERAL- The Secretary is authorized to pay the operation, maintenance, and replacement costs of the Project allocable to the Project Participants under section 10604 until the date on which the Secretary declares any section of the Project to be substantially complete and delivery of water generated by, and through, that section of the Project can be made to a Project participant.
- (2) PROJECT PARTICIPANT PAYMENTS- Beginning on the date described in paragraph (1), each Project Participant shall pay all allocated operation, maintenance, and replacement costs for that substantially completed section of the Project, in accordance with contracts entered into pursuant to section 10604, except as provided in section 10604(f).
- (h) No Precedent- Nothing in this Act shall be construed as authorizing or establishing a precedent for any type of transfer of Colorado River System water between the Upper Basin and Lower Basin. Nor shall anything in this Act be construed as expanding the Secretary's authority in the Upper Basin.
- (i) Unique Situation- Diversions by the Project consistent with this section address critical tribal and non-Indian water supply needs under unique circumstances, which include, among other things--
- (1) the intent to benefit an American Indian tribe;
- (2) the Navajo Nation's location in both the Upper and Lower Basin;
- (3) the intent to address critical Indian water needs in the State of Arizona and Indian and non-Indian water needs in the State of New Mexico,

- (4) the location of the Navajo Nation's capital city of Window Rock in the State of Arizona in close proximity to the border of the State of New Mexico and the pipeline route for the Project;
- (5) the lack of other reasonable options available for developing a firm, sustainable supply of municipal water for the Navajo Nation at Window Rock in the State of Arizona; and
- (6) the limited volume of water to be diverted by the Project to supply municipal uses in the Window Rock area in the State of Arizona.

(j) Consensus- Congress notes the consensus of the Governors' Representatives on Colorado River Operations of the States that are signatory to the Colorado River Compact regarding the diversions authorized for the Project under this section.

(k) Efficient Use- The diversions and uses authorized for the Project under this Section represent unique and efficient uses of Colorado River apportionments in a manner that Congress has determined would be consistent with the obligations of the United States to the Navajo Nation.

SEC. 10604. PROJECT CONTRACTS.

(a) Navajo Nation Contract-

(1) HYDROLOGIC DETERMINATION- Congress recognizes that the Hydrologic Determination necessary to support approval of the Contract has been completed.

(2) CONTRACT APPROVAL-

(A) APPROVAL-

(i) IN GENERAL- Except to the extent that any provision of the Contract conflicts with this subtitle, Congress approves, ratifies, and confirms the Contract.

(ii) AMENDMENTS- To the extent any amendment is executed to make the Contract consistent with this subtitle, that amendment is authorized, ratified, and confirmed.

(B) EXECUTION OF CONTRACT- The Secretary, acting on behalf of the United States, shall enter into the Contract to the extent that the Contract does not conflict with this subtitle (including any amendment that is required to make the Contract consistent with this subtitle).

(3) NONREIMBURSABILITY OF ALLOCATED COSTS- The following costs shall be nonreimbursable and not subject to repayment by the Nation or any other Project beneficiary:

(A) Any share of the construction costs of the Nation relating to the Project authorized by section 10602(a).

(B) Any costs relating to the construction of the Navajo Indian Irrigation Project that may otherwise be allocable to the Nation for use of any facility of the Navajo Indian Irrigation Project to convey water to each Navajo community under the Project.

(C) Any costs relating to the construction of Navajo Dam that may otherwise be allocable to the Nation for water deliveries under the Contract.

(4) OPERATION, MAINTENANCE, AND REPLACEMENT OBLIGATION- Subject to subsection (f), the Contract shall include provisions under which the Nation shall pay any costs relating to the operation, maintenance, and replacement of each facility of the Project that are allocable to the Nation.

(5) LIMITATION, CANCELLATION, TERMINATION, AND RESCISSION- The Contract may be limited by a term of years, canceled, terminated, or rescinded only by an Act of Congress.

(b) City of Gallup Contract-

(1) CONTRACT AUTHORIZATION- Consistent with this subtitle, the Secretary is authorized to enter into a repayment contract with the City that requires the City--

(A) to repay, within a 50-year period, the share of the construction costs of the City relating to the Project, with interest as provided under section 10305; and

(B) consistent with section 10603(g), to pay the operation, maintenance, and replacement costs of the Project that are allocable to the City.

(2) CONTRACT PREPAYMENT-

(A) IN GENERAL- The contract authorized under paragraph (1) may allow the City to satisfy the repayment obligation of the City for construction costs of the Project on the payment of the share of the City prior to the initiation of construction.

(B) AMOUNT- The amount of the share of the City described in subparagraph (A) shall be determined by agreement between the Secretary and the City.

(C) REPAYMENT OBLIGATION- Any repayment obligation established by the Secretary and the City pursuant to subparagraph (A) shall be subject to a final cost allocation by the Secretary on project completion and to the limitations set forth in paragraph (3).

(3) SHARE OF CONSTRUCTION COSTS-

(A) IN GENERAL- Subject to subparagraph (B), the Secretary shall determine the share of the construction costs of the Project allocable to the City and establish the percentage of the allocated construction costs that the City shall be required to repay pursuant to the contract entered into under paragraph (1), based on the ability of the City to pay.

(B) MINIMUM PERCENTAGE- Notwithstanding subparagraph (A), the repayment obligation of the City shall be at least 25 percent of the construction costs of the Project that are allocable to the City, but shall in no event exceed 35 percent.

(4) EXCESS CONSTRUCTION COSTS- Any construction costs of the Project allocable to the City in excess of the repayment obligation of the City, as determined under paragraph (3), shall be nonreimbursable.

(5) GRANT FUNDS- A grant from any other Federal source shall not be credited toward the amount required to be repaid by the City under a repayment contract.

(6) TITLE TRANSFER- If title is transferred to the City prior to repayment under section 10602(f), the City shall be required to provide assurances satisfactory to the Secretary of fulfillment of the remaining repayment obligation of the City.

(7) WATER DELIVERY SUBCONTRACT- The Secretary shall not enter into a contract under paragraph (1) with the City until the City has secured a water supply for the City's portion of the Project described in section 10603(b)(2)(B), by entering into, as approved by the Secretary, a water delivery subcontract for a period of not less than 40 years beginning on the date on which the construction of any facility of the Project serving the City is completed, with--

(A) the Nation, as authorized by the Contract;

(B) the Jicarilla Apache Nation, as authorized by the settlement contract between the United States and the Jicarilla Apache Tribe, authorized by the Jicarilla Apache Tribe Water Rights Settlement Act (Public Law 102-441; 106 Stat. 2237); or

(C) an acquired alternate source of water, subject to approval of the Secretary and the State of New Mexico, acting through the New Mexico Interstate Stream Commission and the New Mexico State Engineer.

(c) Jicarilla Apache Nation Contract-

(1) CONTRACT AUTHORIZATION- Consistent with this subtitle, the Secretary is authorized to enter into a repayment contract with the Jicarilla Apache Nation that requires the Jicarilla Apache Nation--

(A) to repay, within a 50-year period, the share of any construction cost of the Jicarilla Apache Nation relating to the Project, with interest as provided under section 10305; and

(B) consistent with section 10603(g), to pay the operation, maintenance, and replacement costs of the Project that are allocable to the Jicarilla Apache Nation.

(2) CONTRACT PREPAYMENT-

(A) IN GENERAL- The contract authorized under paragraph (1) may allow the Jicarilla Apache Nation to satisfy the repayment obligation of the Jicarilla Apache Nation for construction costs of the Project on the payment of the share of the Jicarilla Apache Nation prior to the initiation of construction.

(B) AMOUNT- The amount of the share of Jicarilla Apache Nation described in subparagraph (A) shall be determined by agreement between the Secretary and the Jicarilla Apache Nation.

(C) REPAYMENT OBLIGATION- Any repayment obligation established by the Secretary and the Jicarilla Apache Nation pursuant to subparagraph (A) shall be subject to a final cost allocation by the Secretary on project completion and to the limitations set forth in paragraph (3).

(3) SHARE OF CONSTRUCTION COSTS-

(A) IN GENERAL- Subject to subparagraph (B), the Secretary shall determine the share of the construction costs of the Project allocable to the Jicarilla Apache Nation and establish the percentage of the allocated construction costs of the Jicarilla Apache Nation that the Jicarilla Apache Nation shall be required to repay based on the ability of the Jicarilla Apache Nation to pay.

(B) MINIMUM PERCENTAGE- Notwithstanding subparagraph (A), the repayment obligation of the Jicarilla Apache Nation shall be at least 25 percent of the construction costs of the Project that are allocable to the Jicarilla Apache Nation, but shall in no event exceed 35 percent.

(4) EXCESS CONSTRUCTION COSTS- Any construction costs of the Project allocable to the Jicarilla Apache Nation in excess of the repayment obligation of the Jicarilla Apache Nation as determined under paragraph (3), shall be nonreimbursable.

(5) GRANT FUNDS- A grant from any other Federal source shall not be credited toward the share of the Jicarilla Apache Nation of construction costs.

(6) NAVAJO INDIAN IRRIGATION PROJECT COSTS- The Jicarilla Apache Nation shall have no obligation to repay any Navajo Indian Irrigation Project construction costs that might otherwise be allocable to the Jicarilla Apache Nation for use of the Navajo Indian Irrigation Project facilities to convey water to the Jicarilla Apache Nation, and any such costs shall be nonreimbursable.

(d) Capital Cost Allocations-

(1) IN GENERAL- For purposes of estimating the capital repayment requirements of the Project Participants under this section, the Secretary shall review and, as appropriate, update the Draft Impact Statement allocating capital construction costs for the Project.

(2) FINAL COST ALLOCATION- The repayment contracts entered into with Project Participants under this section shall require that the Secretary perform a final cost allocation when construction of the Project is determined to be substantially complete.

(3) REPAYMENT OBLIGATION- The Secretary shall determine the repayment obligation of the Project Participants based on the final cost allocation identifying reimbursable and nonreimbursable capital costs of the Project consistent with this subtitle.

(e) Operation, Maintenance, and Replacement Cost Allocations- For purposes of determining the operation, maintenance, and replacement obligations of the Project Participants under this section, the Secretary shall review and, as appropriate, update the Draft Impact Statement that allocates operation, maintenance, and replacement costs for the Project.

(f) Temporary Waivers of Payments-

(1) IN GENERAL- On the date on which the Secretary declares a section of the Project to be substantially complete and delivery of water generated by and through that section of the Project can be made to the Nation, the Secretary may waive, for a period of not more than 10 years, the operation, maintenance, and replacement costs allocable to the Nation for that section of the Project that the Secretary determines are in excess of the ability of the Nation to pay.

(2) SUBSEQUENT PAYMENT BY NATION- After a waiver under paragraph (1), the Nation shall pay all allocated operation, maintenance, and replacement costs of that section of the Project.

(3) PAYMENT BY UNITED STATES- Any operation, maintenance, or replacement costs waived by the Secretary under paragraph (1) shall be paid by the United States and shall be nonreimbursable.

(4) EFFECT ON CONTRACTS- Failure of the Secretary to waive costs under paragraph (1) because of a lack of availability of Federal funding to pay the costs under paragraph (3) shall not alter the obligations of the Nation or the United States under a repayment contract.

(5) TERMINATION OF AUTHORITY- The authority of the Secretary to waive costs under paragraph (1) with respect to a Project facility transferred to the Nation under section 10602(f) shall terminate on the date on which the Project facility is transferred.

(g) Project Construction Committee- The Secretary shall facilitate the formation of a project construction committee with the Project Participants and the State of New Mexico--

(1) to review cost factors and budgets for construction and operation and maintenance activities;

(2) to improve construction management through enhanced communication; and

(3) to seek additional ways to reduce overall Project costs.

SEC. 10605. NAVAJO NATION MUNICIPAL PIPELINE.

(a) Use of Navajo Nation Pipeline- In addition to use of the Navajo Nation Municipal Pipeline to convey the Animas-La Plata Project water of the Nation, the Nation may use the Navajo Nation Municipal Pipeline to convey non-Animas La Plata Project water for municipal and industrial purposes.

(b) Conveyance of Title to Pipeline-

(1) IN GENERAL- On completion of the Navajo Nation Municipal Pipeline, the Secretary may enter into separate agreements with the City of Farmington, New Mexico and the Nation to convey title to each portion of the Navajo Nation Municipal Pipeline facility or section of the Pipeline to the City of Farmington and the Nation after execution of a Project operations agreement approved by the Secretary, the Nation, and the City of Farmington that sets forth any terms and conditions that the Secretary determines are necessary.

(2) CONVEYANCE TO THE CITY OF FARMINGTON OR NAVAJO NATION- In conveying title to the Navajo Nation Municipal Pipeline under this subsection, the Secretary shall convey--

(A) to the City of Farmington, the facilities and any land or interest in land acquired by the United States for the construction, operation, and maintenance of the Pipeline that are located within the corporate boundaries of the City; and

(B) to the Nation, the facilities and any land or interests in land acquired by the United States for the construction, operation, and maintenance of the Pipeline that are located outside the corporate boundaries of the City of Farmington.

(3) EFFECT OF CONVEYANCE- The conveyance of title to the Pipeline shall not affect the application of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) relating to the use of water associated with the Animas-La Plata Project.

(4) LIABILITY-

(A) IN GENERAL- Effective on the date of the conveyance authorized by this subsection, the United States shall not be held liable by any court for damages of any kind arising out of any act, omission, or occurrence relating to the land, buildings, or facilities conveyed under this subsection, other than damages caused by acts of negligence committed by the United States or by employees or agents of the United States prior to the date of conveyance.

(B) TORT CLAIMS- Nothing in this subsection increases the liability of the United States beyond the liability

provided under chapter 171 of title 28, United States Code (commonly known as the `Federal Tort Claims Act').

(5) NOTICE OF PROPOSED CONVEYANCE- Not later than 45 days before the date of a proposed conveyance of title to the Pipeline, the Secretary shall submit to the Committee on Natural Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate, notice of the conveyance of the Pipeline.

SEC. 10606. AUTHORIZATION OF CONJUNCTIVE USE WELLS.

- (a) Conjunctive Groundwater Development Plan- Not later than 1 year after the date of enactment of this Act, the Nation, in consultation with the Secretary, shall complete a conjunctive groundwater development plan for the wells described in subsections (b) and (c).
- (b) Wells in the San Juan River Basin- In accordance with the conjunctive groundwater development plan, the Secretary may construct or rehabilitate wells and related pipeline facilities to provide capacity for the diversion and distribution of not more than 1,670 acre-feet of groundwater in the San Juan River Basin in the State of New Mexico for municipal and domestic uses.
- (c) Wells in the Little Colorado and Rio Grande Basins-
- (1) IN GENERAL- In accordance with the Project and conjunctive groundwater development plan for the Nation, the Secretary may construct or rehabilitate wells and related pipeline facilities to provide capacity for the diversion and distribution of--
 - (A) not more than 680 acre-feet of groundwater in the Little Colorado River Basin in the State of New Mexico;
 - (B) not more than 80 acre-feet of groundwater in the Rio Grande Basin in the State of New Mexico; and
 - (C) not more than 770 acre-feet of groundwater in the Little Colorado River Basin in the State of Arizona.
 - (2) USE- Groundwater diverted and distributed under paragraph (1) shall be used for municipal and domestic uses.
- (d) Acquisition of Land-
- (1) IN GENERAL- Except as provided in paragraph (2), the Secretary may acquire any land or interest in land that is necessary for the construction, operation, and maintenance of the wells and related pipeline facilities authorized under subsections (b) and (c).
 - (2) LIMITATION- Nothing in this subsection authorizes the Secretary to condemn water rights for the purposes described in paragraph (1).
- (e) Condition- The Secretary shall not commence any construction activity relating to the wells described in subsections (b) and (c) until the Secretary executes the Agreement.

(f) Conveyance of Wells-

(1) IN GENERAL- On the determination of the Secretary that the wells and related facilities are substantially complete and delivery of water generated by the wells can be made to the Nation, an agreement with the Nation shall be entered into, to convey to the Nation title to--

(A) any well or related pipeline facility constructed or rehabilitated under subsections (a) and (b) after the wells and related facilities have been completed; and

(B) any land or interest in land acquired by the United States for the construction, operation, and maintenance of the well or related pipeline facility.

(2) OPERATION, MAINTENANCE, AND REPLACEMENT-

(A) IN GENERAL- The Secretary is authorized to pay operation and maintenance costs for the wells and related pipeline facilities authorized under this subsection until title to the facilities is conveyed to the Nation.

(B) SUBSEQUENT ASSUMPTION BY NATION- On completion of a conveyance of title under paragraph (1), the Nation shall assume all responsibility for the operation and maintenance of the well or related pipeline facility conveyed.

(3) EFFECT OF CONVEYANCE- The conveyance of title to the Nation of the conjunctive use wells under paragraph (1) shall not affect the application of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.).

(g) Use of Project Facilities- The capacities of the treatment facilities, main pipelines, and lateral pipelines of the Project authorized by section 10602(b) may be used to treat and convey groundwater to Nation communities if the Nation provides for payment of the operation, maintenance, and replacement costs associated with the use of the facilities or pipelines.

(h) Limitations- The diversion and use of groundwater by wells constructed or rehabilitated under this section shall be made in a manner consistent with applicable Federal and State law.

SEC. 10607. SAN JUAN RIVER NAVAJO IRRIGATION PROJECTS.

(a) Rehabilitation- Subject to subsection (b), the Secretary shall rehabilitate--

(1) the Fruitland-Cambridge Irrigation Project to serve not more than 3,335 acres of land, which shall be considered to be the total serviceable area of the project; and

(2) the Hogback-Cudei Irrigation Project to serve not more than 8,830 acres of land, which shall be considered to be the total serviceable area of the project.

- (b) Condition- The Secretary shall not commence any construction activity relating to the rehabilitation of the Fruitland-Cambridge Irrigation Project or the Hogback-Cudei Irrigation Project under subsection (a) until the Secretary executes the Agreement.
- (c) Operation, Maintenance, and Replacement Obligation- The Nation shall continue to be responsible for the operation, maintenance, and replacement of each facility rehabilitated under this section.

SEC. 10608. OTHER IRRIGATION PROJECTS.

- (a) In General- Not later than 2 years after the date of enactment of this Act, the Secretary, in consultation with the State of New Mexico (acting through the Interstate Stream Commission) and the Non-Navajo Irrigation Districts that elect to participate, shall--
- (1) conduct a study of Non-Navajo Irrigation District diversion and ditch facilities; and
 - (2) based on the study, identify and prioritize a list of projects, with associated cost estimates, that are recommended to be implemented to repair, rehabilitate, or reconstruct irrigation diversion and ditch facilities to improve water use efficiency.
- (b) Grants- The Secretary may provide grants to, and enter into cooperative agreements with, the Non-Navajo Irrigation Districts to plan, design, or otherwise implement the projects identified under subsection (a)(2).
- (c) Cost-Sharing-
- (1) FEDERAL SHARE- The Federal share of the total cost of carrying out a project under subsection (b) **shall be not more than 50 percent**, and shall be nonreimbursable.
 - (2) FORM- The non-Federal share required under paragraph (1) may be in the form of in-kind contributions, including the contribution of any valuable asset or service that the Secretary determines would substantially contribute to a project carried out under subsection (b).
 - (3) STATE CONTRIBUTION- The Secretary may accept from the State of New Mexico a partial or total contribution toward the non-Federal share for a project carried out under subsection (b).

SEC. 10609. AUTHORIZATION OF APPROPRIATIONS.

- (a) Authorization of Appropriations for Navajo-Gallup Water Supply Project-
- (1) IN GENERAL- There is authorized to be appropriated to the Secretary to plan, design, and construct the Project **\$870,000,000 for the period of fiscal years 2009 through 2024**, to remain available until expended.

- (2) ADJUSTMENTS- The amount under paragraph (1) shall be adjusted by such amounts as may be required by reason of changes since 2007 in construction costs, as indicated by engineering cost indices applicable to the types of construction involved.
- (3) USE- In addition to the uses authorized under paragraph (1), amounts made available under that paragraph may be used for the conduct of related activities to comply with Federal environmental laws.
- (4) OPERATION AND MAINTENANCE-
- (A) IN GENERAL- There are authorized to be appropriated such sums as are necessary to operate and maintain the Project consistent with this subtitle.
- (B) EXPIRATION- The authorization under subparagraph (A) shall expire 10 years after the year the Secretary declares the Project to be substantially complete.
- (b) Appropriations for Conjunctive Use Wells-
- (1) SAN JUAN WELLS- There is authorized to be appropriated to the Secretary for the construction or rehabilitation and operation and maintenance of conjunctive use wells under section 10606(b) **\$30,000,000, as adjusted** under paragraph (3), for the period of fiscal years 2009 through 2019.
- (2) WELLS IN THE LITTLE COLORADO AND RIO GRANDE BASINS- There are authorized to be appropriated to the Secretary for the construction or rehabilitation and operation and maintenance of conjunctive use wells under section 10606(c) such sums as are necessary for the period of fiscal years 2009 through 2024.
- (3) ADJUSTMENTS- The amount under paragraph (1) shall be adjusted by such amounts as may be required by reason of changes since 2008 in construction costs, as indicated by engineering cost indices applicable to the types of construction or rehabilitation involved.
- (4) NONREIMBURSABLE EXPENDITURES- Amounts made available under paragraphs (1) and (2) shall be nonreimbursable to the United States.
- (5) USE- In addition to the uses authorized under paragraphs (1) and (2), amounts made available under that paragraph may be used for the conduct of related activities to comply with Federal environmental laws.
- (6) LIMITATION- Appropriations authorized under paragraph (1) shall not be used for operation or maintenance of any conjunctive use wells at a time in excess of 3 years after the well is declared substantially complete.
- (c) San Juan River Irrigation Projects-
- (1) IN GENERAL- There are authorized to be appropriated to the Secretary--

(A) to carry out section 10607(a)(1), not more than **\$7,700,000, as adjusted** under paragraph (2), for the period of fiscal years 2009 through 2016, to remain available until expended; and

(B) to carry out section 10607(a)(2), not more than \$15,400,000, as adjusted under paragraph (2), for the period of fiscal years 2009 through 2019, to remain available until expended.

(2) ADJUSTMENT- The amounts made available under paragraph (1) shall be adjusted by such amounts as may be required by reason of changes since January 1, 2004, in construction costs, as indicated by engineering cost indices applicable to the types of construction involved in the rehabilitation.

(3) NONREIMBURSABLE EXPENDITURES- Amounts made available under this subsection shall be nonreimbursable to the United States.

(d) Other Irrigation Projects- There are authorized to be appropriated to the Secretary to carry out section 10608 **\$11,000,000** for the period of fiscal years 2009 through 2019.

(e) **Cultural Resources-**

(1) IN GENERAL- The Secretary may use **not more than 2 percent** of amounts made available under subsections (a), (b), and (c) for the survey, recovery, protection, preservation, and display of archaeological resources in the area of a Project facility or conjunctive use well.

(2) NONREIMBURSABLE EXPENDITURES- Any amounts made available under paragraph (1) shall be nonreimbursable.

(f) **Fish and Wildlife Facilities-**

(1) IN GENERAL- In association with the development of the Project, the Secretary may use **not more than 4 percent** of amounts made available under subsections (a), (b), and (c) to purchase land and construct and maintain facilities to mitigate the loss of, and improve conditions for the propagation of, fish and wildlife if any such purchase, construction, or maintenance will not affect the operation of any water project or use of water.

(2) NONREIMBURSABLE EXPENDITURES- Any amounts expended under paragraph (1) shall be nonreimbursable.

PART IV--NAVAJO NATION WATER RIGHTS

SEC. 10701. AGREEMENT.

(a) Agreement Approval-

(1) APPROVAL BY CONGRESS- Except to the extent that any provision of the Agreement conflicts with this subtitle, Congress

approves, ratifies, and confirms the Agreement (including any amendments to the Agreement that are executed to make the Agreement consistent with this subtitle).

(2) EXECUTION BY SECRETARY- The Secretary shall enter into the Agreement to the extent that the Agreement does not conflict with this subtitle, including--

(A) any exhibits to the Agreement requiring the signature of the Secretary; and

(B) any amendments to the Agreement necessary to make the Agreement consistent with this subtitle.

(3) AUTHORITY OF SECRETARY- The Secretary may carry out any action that the Secretary determines is necessary or appropriate to implement the Agreement, the Contract, and this section.

(4) ADMINISTRATION OF NAVAJO RESERVOIR RELEASES- The State of New Mexico may administer water that has been released from storage in Navajo Reservoir in accordance with subparagraph 9.1 of the Agreement.

(b) Water Available Under Contract-

(1) QUANTITIES OF WATER AVAILABLE-

(A) IN GENERAL- Water shall be made available annually under the Contract for projects in the State of New Mexico supplied from the Navajo Reservoir and the San Juan River (including tributaries of the River) under New Mexico State Engineer File Numbers 2849, 2883, and 3215 in the quantities described in subparagraph (B).

(B) WATER QUANTITIES- The quantities of water referred to in subparagraph (A) are as follows:

	Diversion (acre/feet/year)	Depletion (acre-feet/year)
Indian Irrigation Project	508,000	270,000
Navajo-Gallup Water Supply Project	22,650	20,780
Animas-La Plata Project	4,680	2,340
TOTAL	535,330	293,120

(C) MAXIMUM QUANTITY- A diversion of water to the Nation under the Contract for a project described in subparagraph (B) shall not exceed the quantity of water necessary to supply the amount of depletion for the project.

(D) TERMS, CONDITIONS, AND LIMITATIONS- The diversion and use of water under the Contract shall be subject to and consistent with the terms, conditions, and limitations of the Agreement, this subtitle, and any other applicable law.

(2) AMENDMENTS TO CONTRACT- The Secretary, with the consent of the Nation, may amend the Contract if the Secretary determines that the amendment is--

(A) consistent with the Agreement; and

(B) in the interest of conserving water or facilitating beneficial use by the Nation or a subcontractor of the Nation.

(3) RIGHTS OF THE NATION- The Nation may, under the Contract--

(A) use tail water, wastewater, and return flows attributable to a use of the water by the Nation or a subcontractor of the Nation if--

(i) the depletion of water does not exceed the quantities described in paragraph (1); and

(ii) the use of tail water, wastewater, or return flows is consistent with the terms, conditions, and limitations of the Agreement, and any other applicable law; and

(B) change a point of diversion, change a purpose or place of use, and transfer a right for depletion under this subtitle (except for a point of diversion, purpose or place of use, or right for depletion for use in the State of Arizona under section 10603(b)(2)(D)), to another use, purpose, place, or depletion in the State of New Mexico to meet a water resource or economic need of the Nation if--

(i) the change or transfer is subject to and consistent with the terms of the Agreement, the Partial Final Decree described in paragraph 3.0 of the Agreement, the Contract, and any other applicable law; and

(ii) a change or transfer of water use by the Nation does not alter any obligation of the United States, the Nation, or another party to pay or repay project construction, operation, maintenance, or replacement costs under this subtitle and the Contract.

(c) Subcontracts-

(1) IN GENERAL-

(A) SUBCONTRACTS BETWEEN NATION AND THIRD PARTIES- The Nation may enter into subcontracts for the delivery of Project water under the Contract to third parties for any beneficial use in the State of New Mexico (on or off land held by the United States in trust for the Nation or a member of the Nation or land held in fee by the Nation).

(B) APPROVAL REQUIRED- A subcontract entered into under subparagraph (A) shall not be effective until

approved by the Secretary in accordance with this subsection and the Contract.

(C) SUBMITTAL- The Nation shall submit to the Secretary for approval or disapproval any subcontract entered into under this subsection.

(D) DEADLINE- The Secretary shall approve or disapprove a subcontract submitted to the Secretary under subparagraph (C) not later than the later of--

- (i) the date that is 180 days after the date on which the subcontract is submitted to the Secretary; and
- (ii) the date that is 60 days after the date on which a subcontractor complies with--

- (I) section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)); and

- (II) any other requirement of Federal law.

(E) ENFORCEMENT- A party to a subcontract may enforce the deadline described in subparagraph (D) under section 1361 of title 28, United States Code.

(F) COMPLIANCE WITH OTHER LAW- A subcontract described in subparagraph (A) shall comply with the Agreement, the Partial Final Decree described in paragraph 3.0 of the Agreement, and any other applicable law.

(G) NO LIABILITY- The Secretary shall not be liable to any party, including the Nation, for any term of, or any loss or other detriment resulting from, a lease, contract, or other agreement entered into pursuant to this subsection.

(2) ALIENATION-

(A) PERMANENT ALIENATION- The Nation shall not permanently alienate any right granted to the Nation under the Contract.

(B) MAXIMUM TERM- The term of any water use subcontract (including a renewal) under this subsection shall be not more than 99 years.

(3) NONINTERCOURSE ACT COMPLIANCE- This subsection--

(A) provides congressional authorization for the subcontracting rights of the Nation; and

(B) is deemed to fulfill any requirement that may be imposed by section 2116 of the Revised Statutes (25 U.S.C. 177).

(4) FORFEITURE- The nonuse of the water supply secured by a subcontractor of the Nation under this subsection shall not result in forfeiture, abandonment, relinquishment, or other loss of any part of a right decreed to the Nation under the Contract or this section.

- (5) NO PER CAPITA PAYMENTS- No part of the revenue from a water use subcontract under this subsection shall be distributed to any member of the Nation on a per capita basis.
- (d) Water Leases Not Requiring Subcontracts-
- (1) AUTHORITY OF NATION-
- (A) IN GENERAL- The Nation may lease, contract, or otherwise transfer to another party or to another purpose or place of use in the State of New Mexico (on or off land that is held by the United States in trust for the Nation or a member of the Nation or held in fee by the Nation) a water right that--
- (i) is decreed to the Nation under the Agreement;
and
- (ii) is not subject to the Contract.
- (B) COMPLIANCE WITH OTHER LAW- In carrying out an action under this subsection, the Nation shall comply with the Agreement, the Partial Final Decree described in paragraph 3.0 of the Agreement, the Supplemental Partial Final Decree described in paragraph 4.0 of the Agreement, and any other applicable law.
- (2) ALIENATION; MAXIMUM TERM-
- (A) ALIENATION- The Nation shall not permanently alienate any right granted to the Nation under the Agreement.
- (B) MAXIMUM TERM- The term of any water use lease, contract, or other arrangement (including a renewal) under this subsection shall be not more than 99 years.
- (3) NO LIABILITY- The Secretary shall not be liable to any party, including the Nation, for any term of, or any loss or other detriment resulting from, a lease, contract, or other agreement entered into pursuant to this subsection.
- (4) NONINTERCOURSE ACT COMPLIANCE- This subsection--
- (A) provides congressional authorization for the lease, contracting, and transfer of any water right described in paragraph (1)(A); and
- (B) is deemed to fulfill any requirement that may be imposed by the provisions of section 2116 of the Revised Statutes (25 U.S.C. 177).
- (5) FORFEITURE- The nonuse of a water right of the Nation by a lessee or contractor to the Nation under this subsection shall not result in forfeiture, abandonment, relinquishment, or other loss of any part of a right decreed to the Nation under the Contract or this section.
- (e) Nullification-
- (1) DEADLINES-
- (A) IN GENERAL- In carrying out this section, the following deadlines apply with respect to implementation of the Agreement:

(i) AGREEMENT- Not later than December 31, 2010, the Secretary shall execute the Agreement.

(ii) CONTRACT- Not later than December 31, 2010, the Secretary and the Nation shall execute the Contract.

(iii) PARTIAL FINAL DECREE- Not later than December 31, 2013, the court in the stream adjudication shall have entered the Partial Final Decree described in paragraph 3.0 of the Agreement.

(iv) FRUITLAND-CAMBRIDGE IRRIGATION PROJECT- Not later than December 31, 2016, the rehabilitation construction of the Fruitland-Cambridge Irrigation Project authorized under section 10607(a)(1) shall be completed.

(v) SUPPLEMENTAL PARTIAL FINAL DECREE- Not later than December 31, 2016, the court in the stream adjudication shall enter the Supplemental Partial Final Decree described in subparagraph 4.0 of the Agreement.

(vi) HOGBACK-CUDEI IRRIGATION PROJECT- Not later than December 31, 2019, the rehabilitation construction of the Hogback-Cudei Irrigation Project authorized under section 10607(a)(2) shall be completed.

(vii) TRUST FUND- Not later than December 31, 2019, the United States shall make all deposits into the Trust Fund under section 10702.

(viii) CONJUNCTIVE WELLS- Not later than December 31, 2019, the funds authorized to be appropriated under section 10609(b)(1) for the conjunctive use wells authorized under section 10606(b) should be appropriated.

(ix) NAVAJO-GALLUP WATER SUPPLY PROJECT- Not later than December 31, 2024, the construction of all Project facilities shall be completed.

(B) EXTENSION- A deadline described in subparagraph (A) may be extended if the Nation, the United States (acting through the Secretary), and the State of New Mexico (acting through the New Mexico Interstate Stream Commission) agree that an extension is reasonably necessary.

(2) REVOCABILITY OF AGREEMENT, CONTRACT AND AUTHORIZATIONS-

(A) PETITION- If the Nation determines that a deadline described in paragraph (1)(A) is not substantially met, the Nation may submit to the court in the stream

adjudication a petition to enter an order terminating the Agreement and Contract.

(B) TERMINATION- On issuance of an order to terminate the Agreement and Contract under subparagraph (A)--

- (i) the Trust Fund shall be terminated;
- (ii) the balance of the Trust Fund shall be deposited in the general fund of the Treasury;
- (iii) the authorizations for construction and rehabilitation of water projects under this subtitle shall be revoked and any Federal activity related to that construction and rehabilitation shall be suspended; and
- (iv) this part and parts I and III shall be null and void.

(3) CONDITIONS NOT CAUSING NULLIFICATION OF SETTLEMENT-

(A) IN GENERAL- If a condition described in subparagraph (B) occurs, the Agreement and Contract shall not be nullified or terminated.

(B) CONDITIONS- The conditions referred to in subparagraph (A) are as follows:

- (i) A lack of right to divert at the capacities of conjunctive use wells constructed or rehabilitated under section 10606.
- (ii) A failure--
 - (I) to determine or resolve an accounting of the use of water under this subtitle in the State of Arizona;
 - (II) to obtain a necessary water right for the consumptive use of water in Arizona;
 - (III) to contract for the delivery of water for use in Arizona; or
 - (IV) to construct and operate a lateral facility to deliver water to a community of the Nation in Arizona, under the Project.

(f) Effect on Rights of Indian Tribes-

(1) IN GENERAL- Except as provided in paragraph (2), nothing in the Agreement, the Contract, or this section quantifies or adversely affects the land and water rights, or claims or entitlements to water, of any Indian tribe or community other than the rights, claims, or entitlements of the Nation in, to, and from the San Juan River Basin in the State of New Mexico.

(2) EXCEPTION- The right of the Nation to use water under water rights the Nation has in other river basins in the State of New Mexico shall be forborne to the extent that the Nation supplies the uses for which the water rights exist by diversions of water from the San Juan River Basin under the Project consistent with subparagraph 9.13 of the Agreement.

SEC. 10702. TRUST FUND.

- (a) Establishment- There is established in the Treasury a fund to be known as the 'Navajo Nation Water Resources Development Trust Fund', consisting of--
- (1) such amounts as are appropriated to the Trust Fund under subsection (f); and
 - (2) any interest earned on investment of amounts in the Trust Fund under subsection (d).
- (b) Use of Funds- The Nation may use amounts in the Trust Fund--
- (1) to investigate, construct, operate, maintain, or replace water project facilities, including facilities conveyed to the Nation under this subtitle and facilities owned by the United States for which the Nation is responsible for operation, maintenance, and replacement costs; and
 - (2) to investigate, implement, or improve a water conservation measure (including a metering or monitoring activity) necessary for the Nation to make use of a water right of the Nation under the Agreement.
- (c) Management- The Secretary shall manage the Trust Fund, invest amounts in the Trust Fund pursuant to subsection (d), and make amounts available from the Trust Fund for distribution to the Nation in accordance with the American Indian Trust Fund Management Reform Act of 1994 (25 U.S.C. 4001 et seq.).
- (d) Investment of the Trust Fund- Beginning on October 1, 2019, the Secretary shall invest amounts in the Trust Fund in accordance with--
- (1) the Act of April 1, 1880 (25 U.S.C. 161);
 - (2) the first section of the Act of June 24, 1938 (25 U.S.C. 162a); and
 - (3) the American Indian Trust Fund Management Reform Act of 1994 (25 U.S.C. 4001 et seq.).
- (e) Conditions for Expenditures and Withdrawals-
- (1) TRIBAL MANAGEMENT PLAN-
 - (A) IN GENERAL- Subject to paragraph (7), on approval by the Secretary of a tribal management plan in accordance with the American Indian Trust Fund Management Reform Act of 1994 (25 U.S.C. 4001 et seq.), the Nation may withdraw all or a portion of the amounts in the Trust Fund.
 - (B) REQUIREMENTS- In addition to any requirements under the American Indian Trust Fund Management Reform Act of 1994 (25 U.S.C. 4001 et seq.), the tribal management plan shall require that the Nation only use amounts in the Trust Fund for the purposes described in subsection (b), including the identification of water conservation measures to be implemented in association with the agricultural water use of the Nation.

- (2) ENFORCEMENT- The Secretary may take judicial or administrative action to enforce the provisions of any tribal management plan to ensure that any amounts withdrawn from the Trust Fund are used in accordance with this subtitle.
- (3) NO LIABILITY- Neither the Secretary nor the Secretary of the Treasury shall be liable for the expenditure or investment of any amounts withdrawn from the Trust Fund by the Nation.
- (4) EXPENDITURE PLAN-
- (A) IN GENERAL- The Nation shall submit to the Secretary for approval an expenditure plan for any portion of the amounts in the Trust Fund made available under this section that the Nation does not withdraw under this subsection.
 - (B) DESCRIPTION- The expenditure plan shall describe the manner in which, and the purposes for which, funds of the Nation remaining in the Trust Fund will be used.
 - (C) APPROVAL- On receipt of an expenditure plan under subparagraph (A), the Secretary shall approve the plan if the Secretary determines that the plan is reasonable and consistent with this subtitle.
- (5) ANNUAL REPORT- The Nation shall submit to the Secretary an annual report that describes any expenditures from the Trust Fund during the year covered by the report.
- (6) LIMITATION- No portion of the amounts in the Trust Fund shall be distributed to any Nation member on a per capita basis.
- (7) CONDITIONS- Any amount authorized to be appropriated to the Trust Fund under subsection (f) shall not be available for expenditure or withdrawal--
- (A) before December 31, 2019; and
 - (B) until the date on which the court in the stream adjudication has entered--
 - (i) the Partial Final Decree; and
 - (ii) the Supplemental Partial Final Decree.
- (f) Authorization of Appropriations- There are authorized to be appropriated for deposit in the Trust Fund--
- (1) \$6,000,000 for each of fiscal years 2010 through 2014; and
 - (2) \$4,000,000 for each of fiscal years 2015 through 2019.

SEC. 10703. WAIVERS AND RELEASES.

- (a) Claims by the Nation and the United States- In return for recognition of the Nation's water rights and other benefits, including but not limited to the commitments by other parties, as set forth in the Agreement and this subtitle, the Nation, on behalf of itself and members of the Nation (other than members in the capacity of the members as allottees), and the United States acting in its capacity as trustee for the Nation, shall execute a waiver and release of--

- (1) all claims for water rights in, or for waters of, the San Juan River Basin in the State of New Mexico that the Nation, or the United States as trustee for the Nation, asserted, or could have asserted, in any proceeding, including but not limited to the stream adjudication, up to and including the effective date described in subsection (e), except to the extent that such rights are recognized in the Agreement or this subtitle;
- (2) all claims for damages, losses, or injuries to water rights or claims of interference with, diversion, or taking of water (including but not limited to claims for injury to lands resulting from such damages, losses, injuries, interference with, diversion, or taking) in the San Juan River Basin in the State of New Mexico that accrued at any time up to and including the effective date described in subsection (e);
- (3) all claims of any damage, loss, or injury or for injunctive or other relief because of the condition of or changes in water quality related to, or arising out of, the exercise of water rights; and
- (4) all claims against the State of New Mexico, its agencies, or employees relating to the negotiation or the adoption of the Agreement.

(b) Claims by the Nation Against the United States- The Nation, on behalf of itself and its members (other than in the capacity of the members as allottees), shall execute a waiver and release of--

- (1) all claims against the United States, its agencies, or employees relating to claims for water rights in or waters of the San Juan River Basin in the State of New Mexico that the United States, acting in its capacity as trustee for the Nation, asserted, or could have asserted, in any proceeding, including but not limited to the stream adjudication;
- (2) all claims against the United States, its agencies, or employees relating to damages, losses, or injuries to water, water rights, land, or natural resources due to loss of water or water rights (including but not limited to damages, losses, or injuries to hunting, fishing, gathering, or cultural rights due to loss of water or water rights; claims relating to inference with, diversion, or taking of water or water rights; or claims relating to failure to protect, acquire, replace, or develop water or water rights) in the San Juan River Basin in the State of New Mexico that first accrued at any time up to and including the effective date described in subsection (e);
- (3) all claims against the United States, its agencies, or employees relating to the pending litigation of claims relating to the Nation's water rights in the stream adjudication; and
- (4) all claims against the United States, its agencies, or employees relating to the negotiation, execution, or the adoption of the Agreement, the decrees, the Contract, or this subtitle.

(c) Reservation of Claims- Notwithstanding the waivers and releases authorized in this subtitle, the Nation on behalf of itself and its members (including members in the capacity of the members as allottees) and the United States acting in its capacity as trustee for the Nation and allottees, retain--

(1) all claims for water rights or injuries to water rights arising out of activities occurring outside the San Juan River Basin in the State of New Mexico, subject to paragraphs 8.0, 9.3, 9.12, 9.13, and 13.9 of the Agreement;

(2) all claims for enforcement of the Agreement, the Contract, the Partial Final Decree, the Supplemental Partial Final Decree, or this subtitle, through any legal and equitable remedies available in any court of competent jurisdiction;

(3) all rights to use and protect water rights acquired pursuant to State law after the date of enactment of this Act;

(4) all claims relating to activities affecting the quality of water not related to the exercise of water rights, including but not limited to any claims the Nation might have under--

(A) the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601 et seq.);

(B) the Safe Drinking Water Act (42 U.S.C. 300f et seq.); and

(C) the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.);

(5) all claims relating to damages, losses, or injuries to land or natural resources not due to loss of water or water rights; and

(6) all rights, remedies, privileges, immunities, and powers not specifically waived and released under the terms of the Agreement or this subtitle.

(d) Tolling of Claims-

(1) IN GENERAL- Each applicable period of limitation and time-based equitable defense relating to a claim described in this section shall be tolled for the period beginning on the date of enactment of this Act and ending on the earlier of--

(A) March 1, 2025; or

(B) the effective date described in subsection (e).

(2) EFFECT OF SUBSECTION- Nothing in this subsection revives any claim or tolls any period of limitation or time-based equitable defense that expired before the date of enactment of this Act.

(3) LIMITATION- Nothing in this section precludes the tolling of any period of limitations or any time-based equitable defense under any other applicable law.

(e) Effective Date-

(1) IN GENERAL- The waivers and releases described in subsections (a) and (b) shall be effective on the date on which the Secretary publishes in the Federal Register a statement of

findings documenting that each of the deadlines described in section 10701(e)(1) have been met.

(2) DEADLINE- If the deadlines described in section 10701(e)(1)(A) have not been met by the later of March 1, 2025, or the date of any extension under section

10701(e)(1)(B)--

(A) the waivers and releases described in subsections (a) and (b) shall be of no effect; and

(B) section 10701(e)(2)(B) shall apply.

SEC. 10704. WATER RIGHTS HELD IN TRUST.

A tribal water right adjudicated and described in paragraph 3.0 of the Partial Final Decree and in paragraph 3.0 of the Supplemental Partial Final Decree shall be held in trust by the United States on behalf of the Nation.