RECLAMATION
Managing Water in the West

Eastern New Mexico Rural Water System Environmental Assessment

Quay, Curry, and Roosevelt Counties, New Mexico
Upper Colorado Region

U. S. Department of the Interior
Bureau of Reclamation
Albuquerque Area Office
Environment Division
Albuquerque, New Mexico

January 27, 2011

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.

U.S. Department of the Interior
Bureau of Reclamation
Albuquerque Area Office
Albuquerque, New Mexico

FINDING OF NO SIGNIFICANT IMPACT

Eastern New Mexico Rural Water Supply Environmental Assessment

For [signature]
Manager, Environment Division

1-26-2011
Date

[signature]
Area Manager, Albuquerque, New Mexico

1-28-11
Date

FONSI Number: AAO-10-002

Summary of the Proposed Action

The Eastern New Mexico Water Utility Authority (ENMWUA: formerly the Eastern New Mexico Rural Water Authority (ENMRWA)), the project proponent, is proposing to construct the Eastern New Mexico Rural Water System Project (Project). The project was authorized on March 30, 2009 in the Omnibus Public Land Management Act of 2009 (P.L. 111-11; 123 Stat. 991 [1300-1303]; Appendix A). If Congress appropriates funds, it is anticipated that the U.S. Bureau of Reclamation (Reclamation) would provide federal funds for project construction. Reclamation would transfer federal funds to the ENMWUA.

The Proposed Action is funding the Project, which consists of construction of a pipeline and associated intake, storage, pumping, water treatment, and delivery facilities from Ute Reservoir to the eastern New Mexico municipalities of Clovis, Elida, Grady, Melrose, Portales, and Texico; Curry and Roosevelt counties; and Cannon Air Force Base (CAFB) (Participating Communities). The overall Project Area for the EA includes the area potentially affected by the Project—portions of Quay, Curry, and Roosevelt counties. The proposed federal action would provide funding to the ENMWUA to deliver 16,450 acre-feet (AF) of water per year from Ute Reservoir to the Participating Communities to meet a portion of current and future water supply needs. The planning horizon considered in this EA is 2060, which is within the normal range for water supply projects (40- to 60-year planning horizons are common). The Project is anticipated to supply water well beyond the planning horizon. Based on the analysis, the Proposed Action would not result in any significant impacts to the environment.

Background

Currently, all Participating Communities rely solely on ground water from the Ogallala aquifer for their M&I water supply. Overall, historical water demand is much greater than aquifer recharge, which has resulted in declining water levels throughout the aquifer. On November 13, 2009, the State Engineer closed the High Plains aquifer in the Curry-Portales Underground Water Basins to new permits for agricultural, commercial, municipal, or industrial wells. Permits for small uses, as well as use transfer (such as agricultural to municipal), changes in well locations, replacement wells and supplemental wells will still be allowed, if statutory requirements are met.

As the water levels in the aquifer drop, well production rates also decline and ground water becomes too expensive to meet demands. Wells then have to be extended or replaced to reach to greater depths. The ability of the Participating Communities to provide a reliable M&I water supply is currently or will soon be limited by declining ground water levels in the Project Area. Most of the Ogallala aquifer in the Project Area is characterized as having "little or no saturated thickness". In addition, some Participating Communities face declining ground water quality that cannot be remedied without additional water treatment infrastructure. As ground water levels decline, water quality often declines as well.

Environmental Impacts

The following resources and socioeconomic factors were evaluated in detail in the Environmental Assessment for anticipated impacts from the proposed Project: water resources, biological resources, socioeconomics and recreation, cultural resources, Indian Trust Assets, and environmental justice. The following resources are discussed further:

Water Resources

Surface water in the Project Area includes Ute Reservoir, the Canadian River downstream of Ute Reservoir to the state line, and sections of Revuelto Creek, Running Water Draw, Frio Draw, and Blackwater Draw. Ground water in the Project Area includes the Ogallala and other freshwater regional aquifers within Quay, Curry, and Roosevelt counties, as well as deep brackish groundwater aquifers.

Water quality varies throughout the project area depending on resource (surface or ground water), aquifer, and location within the aquifer. Generally, the Canadian River has high total dissolved solids (TDS) but is fully supporting of its state-designated uses. Ute Reservoir generally has high TDS, and is impaired for aluminum, and mercury in fish tissues. Freshwater aquifers in the Project Area also generally have high TDS, with localized higher concentrations of radon, fluoride, and arsenic. Deep brackish aquifers by definition have high TDS, and areas of radium concentrations. The Proposed Action would not result in changes to water quality.

Water quantity in Ute Reservoir, as well as releases to the Canadian River, are governed by the Canadian River Compact and Amended Decree. The Compact and Amended Decree restrict water storage on the Canadian River below Conchas Dam, including Ute Reservoir. Approximately 193,240 AF of water can be stored in Ute Reservoir before water must be spilled. Flow in the Canadian River below Ute Dam is a result of spills and seepage. Water level elevations currently average about 3,781 feet, or a surface area of about 6,289 acres. Spills normally occur about once in every 2.4 years under current operations, depending on precipitation inflow and evaporation (and other minor outflows). Seepage in the Canadian River is relatively consistent at about 3 to 5 cfs. The Proposed Action would change the average expected water level and surface area in Ute Reservoir, because there would be withdrawals for project use. Water level elevations under the Proposed Action would average about 3,775 feet (about 5 feet less than the current average) and the surface area would average about 5,508 acres. The Proposed Action would change the duration and frequency of releases that are required under the Canadian River Compact and Amended Decree, to approximately once in 3.2 years. The Proposed Action is not anticipated to have a significant effect on seepage and therefore baseflows in the Canadian River. In addition, the NMISC has committed in the Arkansas River Shiner Management Plan to maintain the existing baseflows in the Canadian River.

The Proposed Action would slightly reduce usage of the Ogallala aquifer, and slightly extend the life of the aquifer. These benefits would not likely be measurable. No significant impacts to surface water, water quality or ground water from this action are expected.

Biological Resources

The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is a candidate for federal listing with known habitat in the project area, and the federally-listed threatened Arkansas River Shiner (*Notropis girardi*) occurs in Revuelto Creek and downstream of Ute Reservoir in the Canadian River. The Canadian River currently sustains populations of native plains river fish, including the Arkansas River speckled chub (*Macrhybopsis tetranema*), the suckermouth minnow (*Phenacobius mirabilis*), and the Arkansas River shiner, which are all listed by the State of New Mexico as Threatened. The existing baseflow regime, fluvial geomorphology, as well as flood flows from Revuelto Creek appear to support a reproducing population of the shiner. The Proposed Action could have minor, immeasureable effects on the baseflow, fluvial geomorphology, or floodflows that support this species. Mitigation measures during construction would eliminate or minimize impacts to the lesser prairie-chicken. The Arkansas River Shiner Management Plan and commitments by the NMISC in consultation with the U.S. Fish and Wildlife Service have resulted in a final determination of "may affect, is not likely to adversely affect" for the shiner. No impact would occur to endangered, threatened, or sensitive plant species. The Section 7 process between Reclamation, Fish and Wildlife Service, and the applicants (NMISC and ENMWUA) is complete, and the Service has provided concurrence that the project is "not likely to adversely affect" any threatened or endangered species.

Minor vegetation impacts would occur from project implementation. Most impacts would be temporary in nature. Permanent impacts would occur where permanent facilities are sited. An increase in water level fluctuations in Ute Reservoir expected under the Proposed Action would result in a shift in shoreline vegetation, including wetlands. The amount of wetlands is anticipated to remain relatively stable. Most permanent wetlands are located at reservoir inlets, which would not be affected by reservoir levels. Minor, temporary construction disturbance to wildlife would occur from the Proposed Action.

Socioeconomics

The primary affected environment for socioeconomics comprises the Participating Communities, and the Quay County communities of Logan and Tucumcari. Logan and Tucumcari's economies rely in part on tourism at Ute Reservoir. Other socioeconomic issues that rely on the reservoir include property values and quality of life. The economies of the Participating Communities rely on a sustainable water source for municipal and industrial uses. The Proposed Action would have a beneficial socioeconomic effect on the Participating Communities by providing a sustainable water supply for residences and businesses. The Proposed Action would have a short-term beneficial effect on Logan and Tucumcari during construction, and a long-term negative effect is possible during drought periods due to lower average water levels in Ute Reservoir.

Recreation

The primary affected environment for recreation includes the boating and fishing facilities at Ute Reservoir. As noted previously, the Proposed Action would result in lower average water levels in Ute Reservoir and could potentially affect access to recreation facilities (for example, boat ramps) and the quality of recreation.

Cultural Resources

Most of the project area has low potential for cultural resources, and few resources were located during surveys of the proposed project facilities. The exceptions are the area south of Ute Reservoir and the vicinity of Blackwater Draw north of Portales. Detailed survey and testing activities have found no significant cultural resources that would be adversely affected by the Proposed Action. The State Historic Preservation Officer, Reclamation and the ENMWUA have executed a Programmatic Agreement for the Project. No traditional cultural properties have been identified in the Project Area during tribal consultation. No significant impacts are expected from the implementation of the Proposed Action.

Environmental Justice

Implementation of the Proposed Action would not disproportionately (unequally) affect any low-income or minority communities within the Project Area.

Indian Trust Assets

No Indian Trust Assets have been documented in the Project Area. Therefore, Reclamation has no impact to Indian Trust Assets resulting from the Proposed Action.

Cumulative Impacts

Cumulative impacts as a result of the proposed action are expected to be low. Cumulative impacts from two reasonably foreseeable actions—climate change and potential future water withdrawals from Ute Reservoir—were considered. The cumulative effects of the proposed action on the identified resources are not significant.

Conclusion

Based on the analysis present in the EA, Reclamation's assessment of Indian Trust Assets and Environmental Justice, Reclamation finds that there would be no significant impacts associated with the proposed action. Reclamation makes this Finding of No Significant Impact (FONSI) pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) and the Council on Environmental Quality implementing regulations (40 CFR 1500). Reclamation has determined that the proposed action does not constitute a major Federal action that would significantly affect the human environment. Therefore, no environmental impact statement will be prepared for this proposal.

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Eastern New Mexico Rural Water System Environmental Assessment

Quay, Curry, and Roosevelt Counties, New Mexico

Cover photograph: Revuelto Creek near proposed pipeline crossing

Prepared by
ERO Resources Corporation
for New Mexico Interstate Stream Commission and Bureau of Reclamation

Acronyms and Abbreviations Used in this Document

ac	acre
AF	acre-feet
AFY	acre-feet per year
asl	above sea level
BA	Biological Assessment
BBER	Bureau of Business and Economic Research
bgs	below ground surface
BMP	Best Management Practice
CAFB	Cannon Air Force Base
Census	U.S. Census Bureau
CEQ	Council on Environmental Quality
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
Compact	Canadian River Compact
CRMWA	Canadian River Municipal Water Authority
DOC	dissolved organic carbon
EA	Environmental Assessment
ENMRWA	Eastern New Mexico Rural Water Authority (precedes ENMWUA)
ENMRWS	Eastern New Mexico Rural Water System; also see “Project”
ENMWUA	Eastern New Mexico Water Utility Authority
ENMU	Eastern New Mexico University
ERO	ERO Resources Corporation
ESA	Endangered Species Act
ft	foot or feet
gpcd	gallons per capita per day
gpm	gallons per minute
ITA	Indian Trust Assets
M&I	municipal and industrial
mg/L	milligrams per liter
mgd	million gallons per day
NEPA	National Environmental Policy Act
NHNMP	Natural Heritage New Mexico Program
NHPA	National Historic Preservation Act
NMAW	New Mexico American Water
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer
Participating Communities	City of Clovis, Town of Elida, Village of Grady, Village of Melrose, City of Portales, City of Texico, Cannon Air Force Base, Curry and Roosevelt counties,
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
Ogallala	High Plains/Ogallala aquifer
PA	Programmatic Agreement
Project	Eastern New Mexico Rural Water System Project
Project Area	Quay, Curry, and Roosevelt counties
Reclamation	U.S. Bureau of Reclamation
Service	U.S. Fish and Wildlife Service

shiner	Arkansas River shiner
SHPO	State Historic Preservation Office
State	State of New Mexico
state line	New Mexico/Texas state line
TDS	total dissolved solids
μS/cm	microsiemens per centimeter
ULSP	Ute Lake State Park
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UWC	Ute Water Commission
WTP	water treatment plant

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Appendices

Chapter 1. Purpose and Need

1.1 Introduction

The Eastern New Mexico Water Utility Authority (ENMWUA), the project proponent, is proposing to construct the Eastern New Mexico Rural Water System Project (Project). The project was authorized on March 30, 2009 in the Omnibus Public Land Management Act of 2009 (P.L. 111-11; 123 Stat. 991 [1300-1303]; Appendix A). If Congress appropriates funds, it is anticipated that the U.S. Bureau of Reclamation (Reclamation) would provide federal funds for project construction. Reclamation would transfer federal funds to the ENMWUA. Reclamation is the lead federal agency for the Environmental Assessment (EA). The Proposed Action is funding the Project, which consists of construction of a pipeline and associated intake, storage, pumping, water treatment, and delivery facilities from Ute Reservoir to the eastern New Mexico municipalities of Clovis, Elida, Grady, Melrose, Portales, and Texico; Curry and Roosevelt counties; and Cannon Air Force Base (CAFB) (Participating Communities; Figure 1). The overall Project Area for the EA includes the area potentially affected by the Project—Quay, Curry, and Roosevelt counties. The proposed federal action would provide funding to the ENMWUA to construct facilities to deliver 16,450 acre-feet (AF) of water per year from Ute Reservoir to the Participating Communities to meet a portion of current and future water supply needs. The planning horizon considered in this EA is 2060, which is within the normal range for water supply projects (40- to 60-year planning horizons are common). The Project is anticipated to supply water well beyond the planning horizon.

Key Dates for Ute Reservoir

- 1950 – Canadian River Compact established
- 1957 and 1959 – Legislative approval for Reservoir and Dam
- 1962 – Reservoir complete
- 1984 – Reservoir expansion
- 1987 – Ute Water Commission established
- 1993 – Lawsuit against New Mexico regarding Canadian River Compact
- 1996 – Joint Powers Agreement reached to reserve 24,000 AF per year of municipal supply for Ute Water Commission
- 1998 – U.S. Fish and Wildlife Service lists the Arkansas River shiner as a threatened species
- 2005 – Arkansas River Shiner Management Plan signed
- 2009 – ENMRWS Project Authorized
- 2010 – Water Utility (ENMWUA) formed as a State entity

The ENMWUA and the New Mexico Congressional delegation are currently seeking federal funding for the Project, to be administered by Reclamation. Because federal funding through Reclamation is a discretionary federal action and subject to compliance with the National

Environmental Policy Act (NEPA), this EA was prepared to evaluate the potential environmental consequences of the Proposed Action and other alternatives for constructing the Project and meeting the project purpose and need.

> The purpose of Ute Reservoir is to store water allocated by the Canadian River Compact to New Mexico. At the time of its planning and construction, Ute Reservoir water was anticipated as a water source for municipal and industrial use, specifically to replace a declining ground water supply in Eastern New Mexico.

1.2 Background

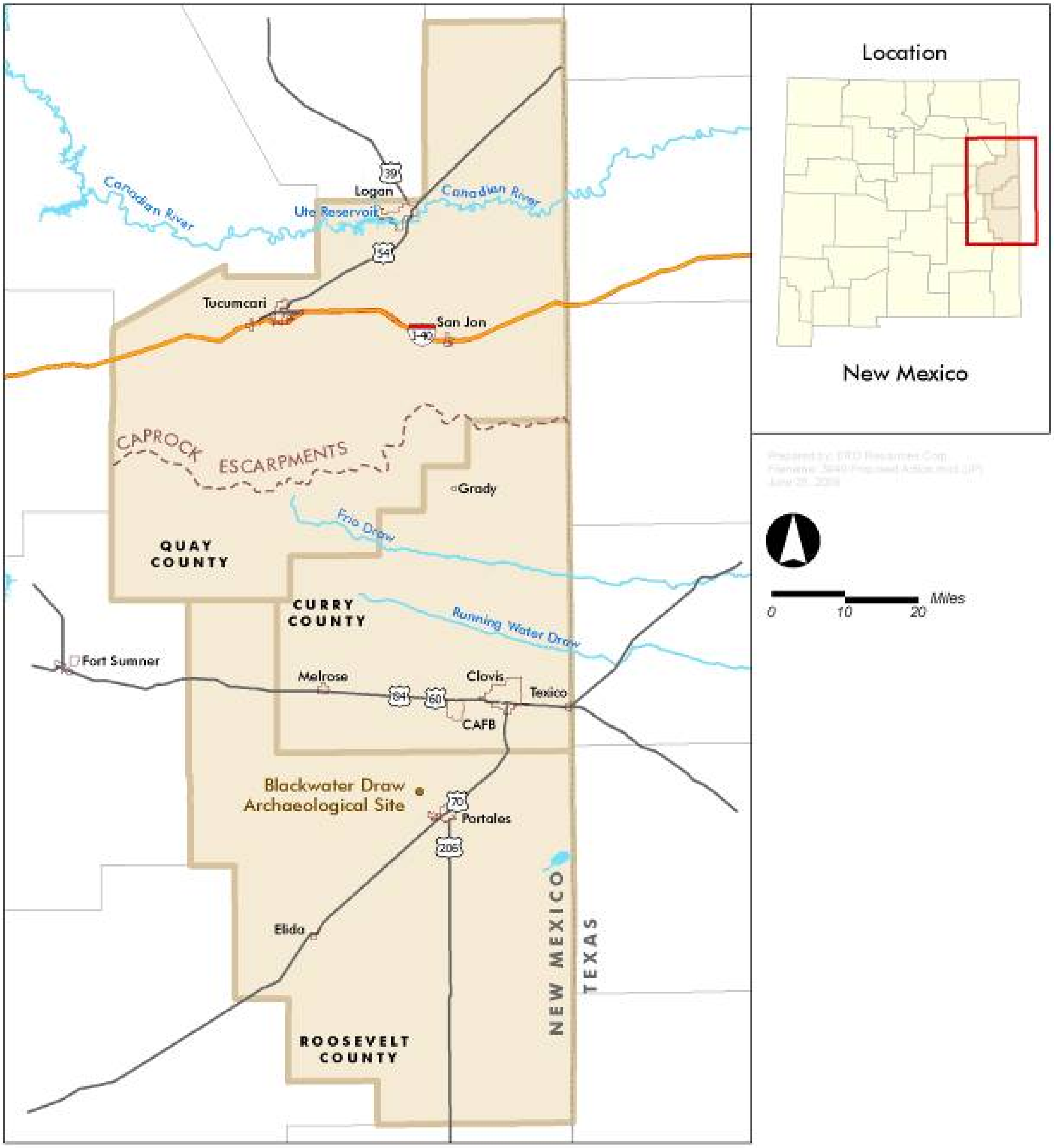
The following background information provides a summary of Ute Reservoir and the compacts, contracts, agreements, management plans, and other legal obligations that dictate its operation and the use of its water. Two documents—the Canadian River Compact (Compact) and the authorizing legislation (see sidebar below) are included in Appendix A.

1.2.1 Ute Reservoir Construction and Expansion

The State of New Mexico (State) constructed Ute Reservoir on the Canadian River in 1962. The purpose of Ute Reservoir was to store water allocated by the Compact to New Mexico. Ute Reservoir water was anticipated as a source for municipal and industrial (M&I) use, specifically to replace a declining ground water supply in Eastern New Mexico. Upon completion, the reservoir had a spillway elevation of 3,760 feet and a maximum capacity of 110,000 AF. In 1984, the State expanded the reservoir, raising the spillway elevation to 3,787 feet and increasing the maximum capacity of the reservoir to 245,000 AF. The water in Ute Reservoir is permitted to the New Mexico Interstate Stream Commission (NMISC), and administered by the Office of the State Engineer (NMOSE). The reservoir is bordered by Ute Lake State Park (ULSP), a popular recreation destination for activities such as boating, fishing, hunting, and camping. Private lands and the Village of Logan also border the USLP.

> **Project Authorization**
>
> The ENMRWS Project was authorized on March 30, 2009. Section 9103 of the Omnibus Public Land Management Act of 2009 authorizes financial and technical assistance to the ENMWUA, with the following limitations:
>
> - No facilities for irrigated agricultural purposes;
> - Total federal cost share not more than 75%;
> - NEPA compliance must be completed prior to expenditure of federal funds for construction; and
> - An Operation, Maintenance and Replacement Plan must be developed.
>
> *Omnibus Public Land Management Act of 2009 (P.L. 111-11; 123 Stat. 991 [1300-1303]; Appendix A)*

Figure 1. Quay, Curry, and Roosevelt Counties in Project Vicinity.



1.2.2 Ute Reservoir Operation and the Compact

Allocations of water from the Canadian River watershed between New Mexico, Texas, and Oklahoma are specified in the Compact as modified by Supreme Court Stipulated Judgment and Decree (Compact; Appendix A). The Compact is a water allocation agreement that allows New Mexico to store certain waters originating in the drainage basin of the Canadian River below the Conchas dam. According to the Compact, New Mexico must release all water in excess of 200,000 AF of total conservation storage in all reservoirs below Conchas Lake. NMISC releases water from Ute Reservoir assuming 6,760 AF of water is in storage capacity in reservoirs other than Ute Reservoir downstream of Conchas Lake. Approximately 193,240 AF of water can be stored in Ute Reservoir before water must be spilled. The Compact limits the amount of water stored, not the amount of water used. The State has no minimum delivery obligations to downstream states under the Compact. Throughout the remainder of this EA, the 193,240 AF storage limit is referred to as the "Compact maximum."

1.2.3 Ute Reservoir Water Contract

In 1997, the Ute Reservoir Water Commission (UWC) entered a contract with the NMISC to maintain an option to purchase and to purchase water stored in the Ute Reservoir for beneficial consumptive uses, including municipal and industrial (M&I), sanitation, recreation and community irrigation uses. The UWC is a 12-member organization that includes the eight members of the ENMWUA (see sidebar). The NMISC sustainable yield analysis found that 24,000 acre-feet per year (AFY) will be available for purchase by UWC. A portion of this water (16,450 AFY) is reserved by the UWC for members of the ENMWUA, and the remainder (7,550 AFY) is allocated by the UWC Quay County members (City of Tucumcari, Village of Logan, and Quay County). The UWC, on behalf of its members, may exercise its option to purchase any portion of the 24,000 AFY for the benefit of any of its members. Diversion plans and specifications must be approved by the NMISC, and diversions are subject to the terms and conditions of State Engineer Surface Permit No. 2900, as amended, and the 1997 Ute Reservoir Water Contract. The UWC is responsible for any water diversion and conveyance facilities, and

Ute Water Commission Apportionment

ENMWUA (Participating Communities)	
City of Clovis	12,292 AF
Village of Elida	50 AF
Village of Grady	75 AF
Village of Melrose	250 AF
City of Portales	3,333 AF
Town of Texico	250 AF
Curry County	100 AF
Roosevelt County	100 AF
Quay County Entities (non-participants)	
Village of San Jon	150 AF
City of Tucumcari	6,000 AF
Quay County	1,000 AF

for securing any easements necessary for those facilities. In addition, the UWC must measure any diverted water and provide documentation of water volumes to the NMISC.

Temporary facilities for withdrawal of UWC water for construction uses for a suburban residential and recreational community along the south shore of Ute Reservoir, are in place. The UWC, on behalf of members Tucumcari and Quay County, has exercised its option to purchase approximately 800 AFY and entered short-term leases with the developer for use of this water.

1.2.4 1962 Memorandum of Agreement

On August 20, 1962, the NMISC and the State Game Commission (now the New Mexico Department of Game and Fish (NMDGF)) entered into a memorandum of agreement that established a minimum reservoir elevation of 3,741.6 feet (commonly referred to as the "fisheries minimum pool"). This agreement requires a minimum pool to be maintained; withdrawals for water supply purposes would be curtailed at that elevation.

1.2.5 Arkansas River Shiner Management Plan

The Canadian River and Revuelto Creek in Quay County provide habitat for the threatened Arkansas River shiner (shiner). In 2005, the State executed an Arkansas River Shiner Management Plan (Management Plan) in lieu of critical habitat designation (U.S. Fish and Wildlife Service (Service) 2005). The plan provides for the protection of State water resources and species. The plan was developed by the Canadian River Municipal Water Authority (CRMWA) to maintain and enhance shiner habitat integrity in the Canadian River between Ute Dam and Meredith Lake, Texas (Service 2005). Objectives of the CRMWA Plan include:

- Maintaining stream flows at existing levels of base flow;
- Controlling saltcedar (*Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*);
- Controlling erosion in riparian zones; and
- Minimizing impacts to shiner low-flow habitat conditions from off-road vehicle groups.

Ongoing surveys conducted by the NMISC and NMGFD indicate that the shiner population between Ute Dam and the New Mexico/Texas state line (state line) composes a relatively high proportion of the total fish abundance in this reach. The population is self-sustaining under the current hydrologic regime (CRMWA 2005). NMISC is committed to maintaining the existing hydrologic regime to protect downstream populations (CRMWA 2005).

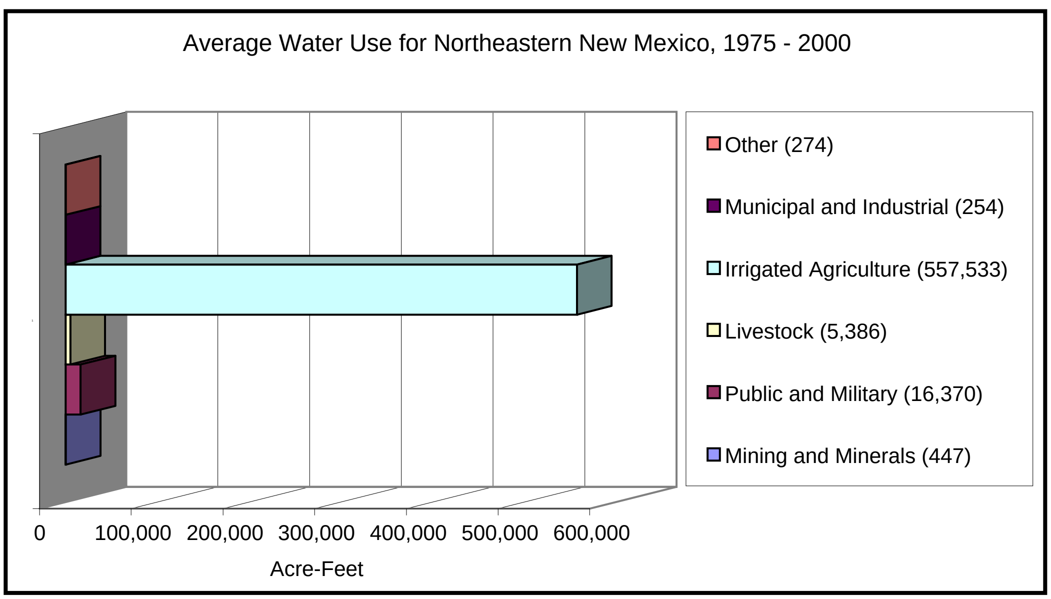
1.3 Purpose and Need

The purpose of the federal action is to provide partial federal funding and oversight to construct facilities related to the Proposed Action. The purpose of the Proposed Action is to provide the Participating Communities in rural eastern New Mexico a long-term sustainable water supply and to deliver, through the Project, 16,450 AF of water annually from Ute Reservoir through 2060. The Project uses 2060 as the planning horizon, and water delivery is anticipated to continue beyond 2060. The need for the Project is to provide the facilities necessary to meet the current and future demand for municipal water, including drinking water.

1.3.1 High Plains/Ogallala Aquifer Uses

The High Plains/Ogallala (Ogallala) aquifer underlies portions of New Mexico, Texas, Oklahoma, and Kansas. At this time, the Ogallala aquifer is the only source of potable water for the Participating Communities, and has many other purposes. The largest withdrawals from the Ogallala aquifer are for irrigated agriculture. In 2002, about 237,300 acres were irrigated in the three-county regions (Quay, Curry, and Roosevelt). Most of the irrigated acreage (94 percent) is in Curry and Roosevelt counties, which are irrigated solely with ground water (D.B. Stephens and Associates 2007). Irrigated agriculture accounts for about 96 percent of all ground water diversions (Figure 2).

Figure 2. Northeast New Mexico Historic Ground Water Diversions.



Source: D.B. Stephens and Associates 2007.
Note: Categories for “municipal and industrial” and “public and military” represent total M&I demands.

1.3.2 Existing Water Supply

Currently, all Participating Communities rely solely on ground water from the Ogallala aquifer for their M&I water supply. Overall, historical water demand is much greater than aquifer recharge, which has resulted in declining water levels throughout the aquifer (Figure 3). On November 13, 2009, the State Engineer closed the High Plains aquifer in the Curry-Portales Underground Water Basins to new permits for agricultural, commercial, municipal, or industrial wells. Permits for small uses, as well as use transfer (such as agricultural to municipal), changes in well locations, replacement wells and supplemental wells will still be allowed, if statutory requirements are met.

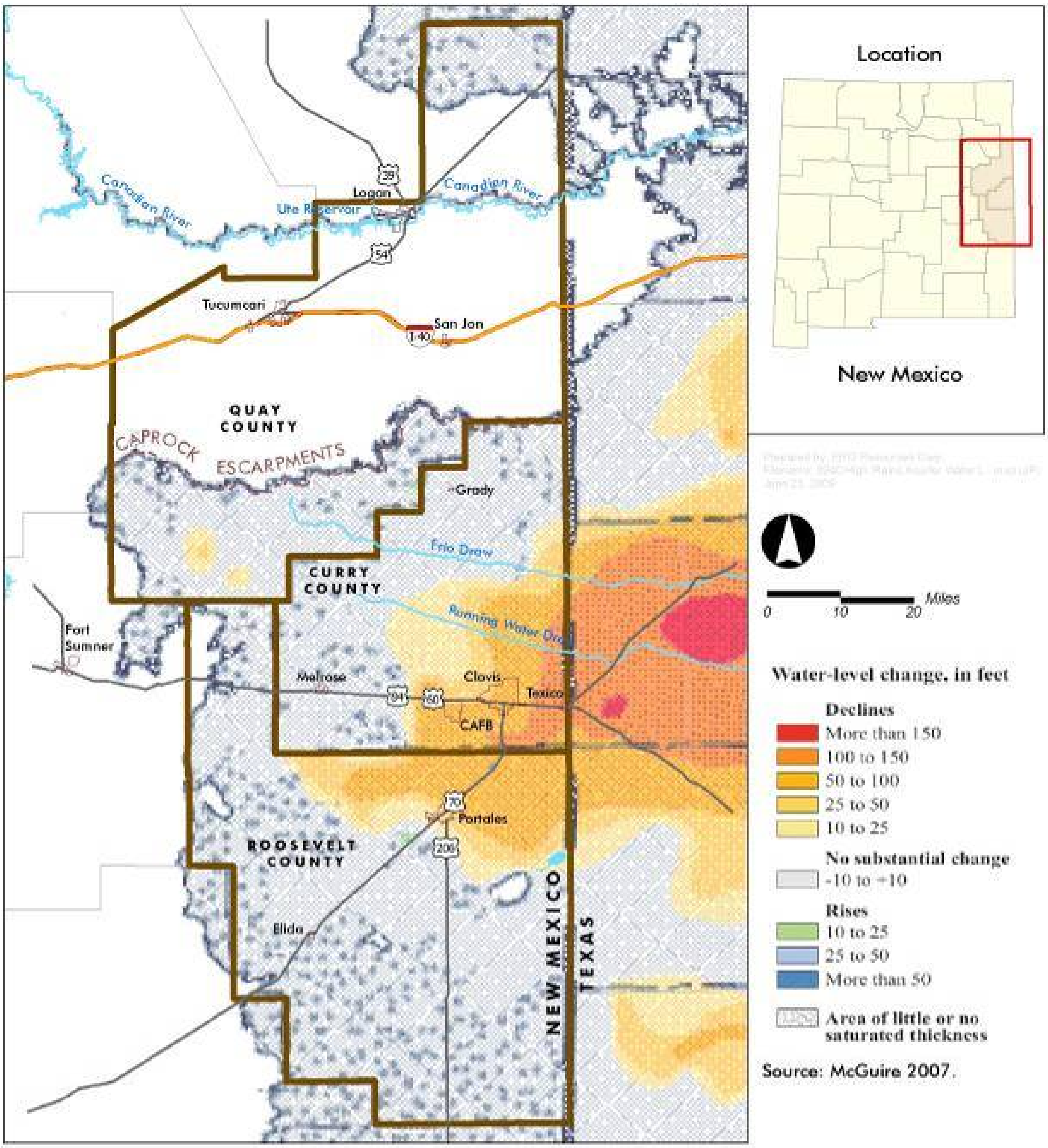
As the water levels in the aquifer drop, well production rates also decline. Wells then have to be extended or replaced to reach to greater depths. The ability of the Participating Communities to provide a reliable M&I water supply is currently or will soon be limited by declining ground water levels in the Project Area. As shown in Figure 3, most of the Ogallala aquifer in the Project Area is characterized as having “little or no saturated thickness” (McGuire 2007). In addition, some Participating Communities face declining ground water quality that cannot be remedied without additional water treatment infrastructure. As ground water levels decline, water quality often declines as well (Section 3.1.23 — Water Quality for more details).

> **City of Clovis Water Supply**
>
> Since 2003, the static water levels in all of NMAW’s wells in the Ogallala aquifer have declined an average of 3 feet per well per year. Annual well production rates are decreasing on average 16 gallons per minute per well, which amounts to a 10 percent decrease in annual output.
>
> “Today we are running 59 wells to produce the same amount of water as we could produce with 28 wells a decade ago” (Kathy Wright, NMAW).
>
> This year, NMAW requires $2.18 million to rehabilitate six irrigation wells and convert them to domestic use to maintain water supplies to existing customers.
>
> *New Mexico Public Regulation Commission May 15, 2009*

The U.S. Geological Survey (USGS) and the Eastern Plains Council of Governments estimate the New Mexico portion of the Ogallala aquifer has a theoretical storage capable of meeting current M&I and agricultural demand through 2040 (McGuire 2003). However, the actual useful life of the Ogallala aquifer may be shorter because of limitations on recoverable storage. Studies by the cities of Portales (Wilson 2001, 2004) and Clovis (New Mexico American Water (NMAW) 2004) determined that the ground water resource in the two-city area would be essentially exhausted between 2033 and 2040. NMAW, water supplier to Clovis, reports that water levels at producing wells are declining rapidly, which limits NMAW’s ability to provide water to Clovis. New wells lose capacity so quickly that they are no longer economical to operate after 8 years (NMAW 2004; see sidebar).

Portales has two well fields in the Ogallala aquifer that supply the City's water. These two well fields have experienced rapid declines in both saturated thickness and well productivity (Wilson 2001, 2007). A 2004 ground water report by Wilson concluded that, even assuming Portales could acquire lands and water rights currently used by farmers in the nearby areas, about 7 years of water supply would remain in 2043 with no other ground water options available.

Figure 3. Declining Water Levels in the Ogallala/High Plains Aquifer within the Project Area.



The other smaller Participating Communities have observed similar declines in well capacities and water levels, and have had to add water supply wells because of the associated reductions in pumping capacity (Cooper, pers. comm. 2008). The smaller communities have fewer water supply options and infrastructure costs (including drilling new wells) are much higher on a per-person basis.

Table 1. Average Water Use, 2004–2006.

Participating Communities	Average Annual Water Use (AF)
City of Clovis	6,162
Town of Elida	49
Village of Grady	21
Village of Melrose	141
City of Portales	4,217
City of Texico	171
Cannon Air Force Base	1,121
Curry County*	1,013
Roosevelt County*	1,776
Total	**14,671**

*Estimated annual demand.
Sources: NMED 2007; Rebman, pers. comm. 2008; NMAW, pers. comm. 2008.

The declining quality of existing ground water supplies, in conjunction with changing State water quality standards (e.g., drinking water standard for arsenic), is another reason for securing a replacement water supply. Aquifer declines have contributed to increased concentrations of certain constituents for drinking water supplies, including total dissolved solids (TDS), arsenic, fluoride, iron, radon, and volatile organic compounds. Currently, the Participating Communities disinfect ground water with chlorine and use well operational blending or temporary well shutdowns to maintain adequate water quality. Additionally, CAFB treats a portion of its water supply with reverse osmosis for removal of fluoride, and the City of Texico uses an airstripper to remove volatile and semivolatile organic compounds. Wells also are taken out of production permanently as water quality declines. Texico, Melrose, Grady, and Elida are experiencing difficulty complying with State and federal drinking water requirements (CH2M HILL 2006a). As water levels decline, constituent concentrations are expected to increase and new treatment systems would be needed.

1.3.3 Existing Water Demand

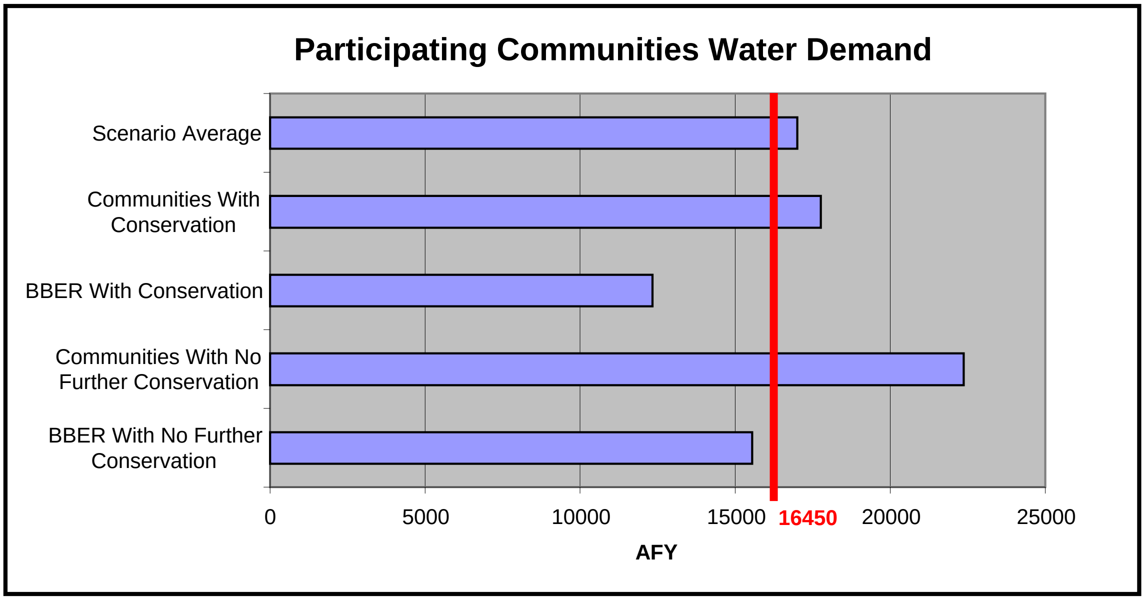
Table 1 shows the average annual water supplied in recent years (2004 to 2006) to the Participating Communities based on actual data (NMED 2007; NMAW, pers. comm. 2008; Rebman, pers. comm. 2008). For Curry and Roosevelt counties, the estimated annual demands are shown. The average water use for the counties is based on current population that would be served by the Project in those counties, multiplied by the average per capita water use. The total average annual water use for the Participating Communities for 2004 to 2006 was about 14,671 AF (Table 2).

1.3.4 Projected Water Demand

The water demand forecasts for Participating Communities used county population projections made by the University of New Mexico Bureau of Business and Economic Research (BBER) and forecasts developed for several Participating Communities in recent 40-year water plans and other studies. BBER county population forecasts were combined with 2000 Census (CH2M HILL 2006b) data to obtain population estimates for Participating Communities. These projections assume that the year-2000 member-to-county population fractions remain constant through the 2060 planning horizon. Based on BBER forecasts, in 2060 the total population for Participating Communities is expected to be 62,932. Under the forecasts developed by Participating Communities, the population is expected to reach 90,576 by 2060 (CH2M HILL 2006b). BBER's estimates of growth likely are conservative, and the Participating Communities' estimates are optimistic; the actual future growth in population probably will lie between the two estimates.

BBER and Participating Communities' projections were coupled with per capita use rates to develop a series of overall water demand forecasts through 2060 (Figure 4). The first set of forecasts assumes that no further conservation will take place in the Participating Communities. These forecasts are based on 2000 per capita use data for each community from the New Mexico Environment Department (NMED). The second set of forecasts assumes the Participating Communities will reduce their per capita use. The average M&I use for the Participating Communities is about 200 gallons per capita per day (gpcd), and the reduced use for forecast purposes was 175 gpcd. The range of M&I water demand/water use in comparable areas in the southwestern U.S. is approximately 144 to 223 gpcd (CH2M HILL 2005a). The 2060 forecasts range from a total projected water need of 12,340 AFY (BBER population projection with conservation measures) to 22,370 AFY (community population projection with no further conservation measures). The average of all water demand projection scenarios is 17,000 AFY. This compares closely with the July 2005 Participating Communities delivery request of 16,450 AFY (Figure 4). The current average demand is about 14,670 AFY.

Figure 4. 2060 Water Demand Forecasts for Participating Communities.



Source: CH2M HILL 2006b.

Water conservation plays an important role in the demand forecasts developed for the Participating Communities. Most Participating Communities have water rate structures that reward water conservation. For example, water gets more expensive per gallon as more is used. Clovis and Portales have wastewater reuse programs involving application of treated effluent to nearby agricultural land (CH2M HILL 2005a). While reuse by agriculture does not reduce per capita M&I demand within the communities, it does have the beneficial effects of slightly reducing overall ground water pumping in the local area. Because irrigated agriculture in the Project Area uses roughly 34 times more water every year than M&I uses, the beneficial effect of M&I reuse is very small. The Ogallala aquifer has high regional demand and low natural recharge, and is "effectively being mined and cannot be considered a renewable resource" (Wilson 2007). Water conservation prolongs well life, but is not a complete or permanent solution. With even the most aggressive conservation (e.g., the Participating Communities use only 50 percent of their current demand), there is still a need for a long-term sustainable potable water supply. This is largely because of high agricultural demand for water, which would overwhelm any effects of conservation.

In summary, the Participating Communities have reserved Ute Reservoir water to meet future M&I water demands and to replace existing unsustainable ground water supplies that are diminishing in quantity and quality. The total reservation of 16,450 AFY will meet all existing needs and a portion of future water needs for the Participating Communities through the 2060 planning horizon, with the exception of the City of Portales. The City of Portales' water reservation is less than existing water use, and the remaining demand will be met by continuing to pump ground water. Table 2 shows a comparison of existing water use, projected water needs, and the amount the Participating Communities have reserved. Some Participating Communities have reserved water in excess of their current and forecasted water needs, while some have reserved less. It is possible for the communities to reallocate or sublease their water allocation to balance community needs.

Table 2. Participating Communities Water Use, Future Demand, and Water Reservation.

Participating Community	Current Water Use (AFY)	2060 Demand Estimate (AFY)[1]	Water Reservation (AFY)
City of Clovis	6,162	8,988	12,292 [2]
Town of Elida	49	74	50
Village of Grady	21	27	75
Village of Melrose	141	203	250
City of Portales	4,217	4,523	3,333
City of Texico	171	293	250
CAFB	1,121	1,706	-
Curry County	1,013	1,188	100
Roosevelt County	1,776	-	100
Totals	14,671	17,002	16,450

[1] Demand estimates for Roosevelt County are incorporated into other entities.

[2] Includes CAFB.

Note: Some Participating Communities have reserved water in excess of their current and forecasted water needs, while some have reserved less. It is possible for the communities to reallocate or sublease their water allocation to balance community needs.

Source: CH2M HILL 2006b.

1.4 Issues Summary

Scoping is the first phase of the public involvement process. It is designed to help determine the scope of issues and alternatives to be addressed in the NEPA process. The intent of the scoping process is to gather comments, concerns, and ideas from those who have an interest in, or may be affected by, the Proposed Action, and identify issues the public and government agencies believe are most important. During September 2007 scoping, Reclamation sought and received input from the public, interested organizations, and agencies to help identify issues for evaluation in the EA. The following issues were identified during scoping.

1.4.1 Surface Water Elevation in Ute Reservoir

The Project would have an intake in Ute Reservoir, and up to 16,450 AFY would be pumped out of the reservoir. The current demands on the reservoir include releases associated with the Compact, reservoir spills, natural evaporation and seepage from the reservoir, and minor construction water uses for 12 Shores at Ute Lake. There is a concern that pumping withdrawals would lower the reservoir's surface water elevation and could affect surrounding residential developments and recreation opportunities (also see Issue 1.4.7, Socioeconomic Conditions).

1.4.2 Surface Water Flow in the Canadian River

The Project would withdraw water from Ute Reservoir as described in Section 1.4.1. Although controlled releases to the Canadian River occur only occasionally (about once every 5 years). when storage in the reservoir exceeds the Compact maximum, flows in the river immediately downstream of the dam are primarily a result of seepage through or beneath the dam. There is a concern that changes in reservoir pool elevation may change the seepage rate and, therefore, change the baseflow in the Canadian River downstream of the dam. Changes in baseflow could affect downstream conditions, including the stream channel and wildlife habitat.

1.4.3 Ground Water Hydrology

Currently, the Participating Communities are relying on a nonsustainable ground water source—the Ogallala aquifer—for M&I water supplies. Water quality and water levels in the aquifer are declining in some areas because the aquifer is mined primarily for agricultural purposes. There is a concern that if the Project does not occur, communities depending on the aquifer may be left without a M&I water supply.

1.4.4 Water Demands and Water Conservation

The purpose and need for the Proposed Action is based on existing and potential future water demands. Current and proposed conservation measures may affect future water demands. There is a concern among Quay County communities that Participating Communities are using too much water, and believe the Participating Communities could implement more conservation measures as an alternative to the Proposed Action.

1.4.5 Water Quality

There is a concern that changes in ground water quality in the absence of the Project could require additional water treatment infrastructure, which would affect water cost. There is also a concern that irrigation use and residential septic tanks around Ute Reservoir are causing poor surface water quality, making it untreatable for potable uses or reducing water treatment options. In addition, there is a concern that pumping water out of Ute Reservoir may affect water quality in the reservoir.

1.4.6 Wildlife and Threatened and Endangered Species

The Project Area provides wildlife habitat. There is a concern that depletions in the surface area of Ute Reservoir and flows in the Canadian River, and temporary or permanent impacts from facilities associated with the Project may affect fish and wildlife habitat, other aquatic life, and habitat for federally threatened and endangered species, including the shiner.

1.4.7 Socioeconomic Conditions

The Project Area is predominantly rural, with Clovis and Portales as the major population centers. Tourism and agriculture are important regional economic sectors in the Project Area. There is a concern that the Proposed Action may affect socioeconomic conditions of Quay, Curry, and Roosevelt counties; communities in these counties; and downstream water users. Potential concerns include impacts to population and employment, changes in water costs, and the effect of changing Ute Reservoir water levels on the Quay County tourism and recreational economy. There is also concern that without an alternative water supply, socioeconomic conditions in Curry and Roosevelt counties, and communities in those counties, may be affected.

1.4.8 Recreation

ULSP is an important recreational resource for the State. Visitation to ULSP is especially high when recreation opportunities are limited at nearby reservoirs (including Brantley and Conchas) due to low lake levels. Ute Reservoir has historically had a stable water elevation compared to other reservoirs in the State. There is a concern that changes in the water levels at Ute Reservoir may change recreational opportunities in the Project Area, specifically in Logan and Quay County. There is also concern about the effect of changing reservoir water levels on the use of private boat docks.

1.4.9 Cultural Resources

The Project Area contains both historic and prehistoric archaeological sites. A variety of historic buildings occur in the Project Area. In addition, four primary areas may contain cultural resources: Blackwater Draw, Muleshoe Dunes, the Canadian River Valley, and draws and playas on the Llano Estacado. There is a concern the Project may adversely affect cultural resources.

1.5 Federal Permits, Licenses, and Approvals

Implementation of the Project would require compliance with applicable federal, state, and local regulatory agency laws, approvals, review, and permitting requirements. Permitting requirements may vary with alternative. The No Action Alternative also may be subject to various regulatory actions and permits. Principal federal, state, and local environmental compliance requirements associated with implementation of the Proposed Action are listed in Table 3. Additional regulatory requirements are listed following the table.

Table 3. Summary of Federal Permits or Approvals.

Agency	Statute, Regulation, or Order	Purpose	Project Application
Federal			
BUREAU OF RECLAMATION	National Environmental Policy Act	Ensures federal agencies consider environmental factors in their decision making	All action alternatives are subject to NEPA compliance because of Reclamation funding
	National Historic Preservation Act, Section 106	Protection of historic and cultural resources in coordination with the State Historic Preservation Office (SHPO)	Surface-disturbing activities, where cultural resources have been identified
	Executive Order 11990, Protection of Wetlands	Requires avoidance of adverse wetland impacts, where practicable, and mitigation, if necessary	Disturbances to wetlands
	Fish and Wildlife Coordination Act	Consideration of fish and wildlife conservation for water resource development projects	Development of mitigation measures for adverse effects to fish and wildlife
	Executive Order 12898, Environmental Justice	Requires consideration of disproportionate impacts to minority or low-income populations	Socioeconomic effects to be evaluated for all alternatives
U.S. ARMY CORPS OF ENGINEERS	Clean Water Act – Section 404 Permit to discharge dredge and fill material	Authorizes placement of fill or dredge material in waters of the U.S. including wetlands	Discharge of dredge or fill material into wetlands or other waters of the U.S.
U.S. FISH AND WILDLIFE SERVICE	Endangered Species Act	Protection of federally listed threatened or endangered species	Adverse impacts to the Project Area's federally listed species
	Migratory Bird Treaty Act	Protects migratory birds	Surface disturbance that may harm or injure migratory birds and nesting

Agency	Statute, Regulation, or Order	Purpose	Project Application
		State of New Mexico	
NEW MEXICO STATE ENGINEERS OFFICE	Well permits	Management of ground water resources	Permits for new wells constructed, or agricultural wells converted to M&I uses, under the No Action Alternative
NEW MEXICO ENVIRONMENT DEPARTMENT	Section 401 water quality certification	Certifies that authorized Section 404 activities meet State water quality standards	Applicable for all disturbances that require Section 404 permitting
	National Pollution Discharge Elimination System Permit for Stormwater	Protects water resources from discharges associated with construction activities	Applicable to all surface construction activities greater than 1 acre
	Construction Dewatering 402 Permit	Protects surface water from discharge of ground water encountered during construction	Excavations for pipelines, dam construction, or other activities that require dewatering
	Air Pollution Emission Notice	Protects air quality from construction activities including vehicle emissions and fugitive dust	Excavation, grading, and blasting for construction of dams, pipelines, roads, borrow areas, and other surface disturbances
	Open Burning Permit	Control open burning	Land-clearing activities that result in burning trees or other materials
NEW MEXICO DEPARTMENT OF GAME AND FISH	Review and comment on Proposed Action and mitigation measures	Protection of fish and wildlife resources	Changes in streamflows, inundation of streams, creation of lake habitat, impacts to terrestrial wildlife habitat from Project development
OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION, NEW MEXICO STATE HISTORIC PRESERVATION OFFICE	Coordination of Section 106 compliance with Reclamation	Determination of eligibility of cultural resources for the National Register of Historic Places (NRHP), significance of impacts, and appropriate mitigation measures	Surface-disturbing activities, where cultural resources have been identified

Additional federal statutes that guide the NEPA development process include the following:

- American Indian Religious Freedom Act of 1978 (P.L. 95-341; 42 U.S.C. 1996);
- Archaeological and Historic Preservation Act of 1974 (16 U.S.C. sections 1531-1543);
- Archaeological Resources Protection Act of 1979 (P.L. 96-95; 16 U.S.C. 470aa-470ll);

- Clean Air Act of 1970 (42 U.S.C. 7401 et seq.; 40 CFR parts 50-87);
- Farmland Protection Policy Act (P.L. 97-98; 7 U.S.C. 4201);
- Historic Sites, Buildings, and Antiquities Act of 1906 (16 U.S.C. sections 431-433);
- National Historic Preservation Act of 1966 (P.L. 95-515; P.L. 102-575; 16 U.S.C. 470);
- Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971 (36 FR 8921);
- Executive Order 11991, Protection and Enhancement of Environmental Quality, March 5, 1970 (35 FR 4247);
- Populations and Low-Income Populations, February 11, 1994 (59 FR 7629);
- Executive Order 13007, Indian Sacred Sites, May 24, 1996 (61 FR 26771); and
- Executive Order 13112, Invasive Species, February 3, 1999 (64 FR 6183).

1.6 Document Organization

This EA consists of eight chapters. Chapter 1 describes the purpose of and need for the Proposed Action, cooperating agencies, project background, related and ongoing activities, and a summary of issues. Chapter 2 describes the process used to formulate alternatives, the alternatives considered in detail, the alternatives considered but eliminated from detailed study, and the proposed action. Chapter 2 also includes a description of Ute Reservoir and a summary comparison of alternatives and impacts. Chapter 3 describes the current condition of resources within the Project Area that could be affected by the alternatives. Chapter 4 describes and analyzes the environmental impacts of the alternatives on Project Area resources. Chapter 5 describes relevant past, present, and reasonably foreseeable actions and their cumulative impacts on Project Area resources. Chapter 6 describes the scoping and public participation process that was conducted during preparation of this EA. Chapter 6 also describes coordination with federal, state, and local agencies; Native American groups; and private organizations. Chapter 7 provides a list of individuals who prepared the EA. Chapter 8 provides a list of referenced material for the EA.

Chapter 2. Alternatives

Chapter 2 presents the alternatives analyzed in this EA: the No Action Alternative – in which federal funding would not be appropriated for construction of the Project and ground water use would continue as it has in the past; and the Proposed Action Alternative (Proposed Action) – in which Reclamation would provide funding to construct a pipeline project including raw water intake, conveyance, and storage; water treatment; and finished water storage and conveyance. Chapter 2 also describes alternatives considered but eliminated.

2.1 No Action Alternative

NEPA requires analysis of a "No Action" alternative (Council on Environmental Quality (CEQ) Guidelines 1502.14). No Action does not necessarily require continuation of current conditions or the status quo, but rather a reasonable projection of future conditions or actions that would occur if the Proposed Action is not implemented. The No Action Alternative is described below and will be analyzed along with the Proposed Action to provide a basis for comparison.

2.1.1 Current M&I Water Supply

All Participating Communities currently rely on ground water from the Ogallala aquifer for their M&I water supply. Overall, total demand on the aquifer (including agricultural demand) is much greater than aquifer recharge, as shown in declining water levels throughout the aquifer (Figure 3). As water levels in the aquifer decline, less water can be pumped out. Well production rates also decline and wells eventually become too expensive to operate given the amount of water they are able to produce.

As discussed in more detail in Chapter 1, the ability of the Participating Communities to provide a reliable M&I water supply is currently or will soon be limited by declining ground water levels in the Project Area.

2.1.2 No Action Alternative

If federal funding is not appropriated or approved for Project construction, the Participating Communities would continue to use the Ogallala aquifer as their only water source. Some communities have opportunities for joint projects due to their proximity (e.g., Clovis and Texico). Most communities see an urgent need for alternative water sources within the next 5 to 10 years, with complete depletion of existing sources within about 40 years. Individual community options for the No Action Alternative are summarized below. Roosevelt County has transferred its water reservations in Ute Reservoir to Portales. Curry County may transfer its reservation to one of the communities within its boundaries. Neither Curry nor Roosevelt county is currently a direct water provider and does not anticipate taking on that role (Pyle, pers. comm. 2008; Hardin, pers. comm. 2008). According to best available information, the ground water resources in the Project Area will be depleted within about 40 years. The No Action Alternative does not meet the purpose and need for the Project in that it does not provide "a long-term sustainable water supply" for the Participating Communities.

For purposes of this EA, the No Action Alternative assumes a continuation of existing conditions in Ute Reservoir. However, in the absence of the Project, the State would likely pursue other purchasers for Ute Reservoir water.

Clovis. Clovis' M&I water system is owned and operated by NMAW. Other than ground water, Clovis has no reasonable options for M&I water supply except for the Proposed Action. NMAW purchases and retires agricultural lands, and converts those water rights to M&I uses. The need for new purchases and additions of new wells to the system is continuous; each new well loses capacity and must be replaced about every 4 years. NMAW has purchased land and water rights for a new well field south of Clovis that will be drilled sometime in the next 10 years. It may be possible to complete a joint water supply project with Texico, CAFB, and Portales; but no formal discussions have taken place (Wright, pers. comm. 2008).

Elida. Elida's current water supply (ground water wells) is located about 11 miles south of town. The need for an alternate water source will be urgent within about 10 years, because the water table in the Elida area is shallower than other parts of the aquifer. Other than ground water, Elida has no reasonable options for M&I water supply except for the Proposed Action. Joint projects with nearby communities are not under discussion, and likely are not an option due to the community's remote location (Nuckols, pers. comm. 2008).

Grady. Grady plans to drill additional ground water wells as needed to supplement the existing well for M&I water supply. However, Grady is a small community with low water demand and a fairly stable water table in its well. Grady has not experienced declines in its water table or well capacity in the past 6 years (Shafer, pers. comm. 2008).

Melrose. Melrose operates a well for its M&I water. Other than ground water, Melrose has no reasonable options for M&I water supply except for the Proposed Action. Additional ground water wells could be drilled; however, Melrose is not currently seeking alternative well sites or agricultural water transfer. The need for an additional water supply is immediate; on hot days, the existing water supply is often inadequate. Joint projects with nearby communities are not under discussion (Bostwick, pers. comm. 2008).

Portales. The Proposed Action would provide about 60 percent of Portales' projected water needs. In the absence of the Project, Portales would continue to drill additional wells on lands already owned by the city. Portales would continue to purchase and transfer additional agricultural land and water rights according to its 40-year plan (Wilson 2004). Portales would potentially move more aggressively on some of its existing plans and research, including complete water reuse and options for deep ground water desalination. Joint projects with nearby communities are not under discussion (Ortega, pers. comm. 2008).

Texico. Texico would continue its existing strategy for M&I water supplies, which includes purchasing agricultural land and water rights, converting them to M&I purposes, and tying them into the water system. Other than ground water, Texico has no reasonable options for M&I water supply except for the Proposed Action. Currently, Texico needs to drill new wells approximately every 5 years to maintain an adequate water supply. Therefore, land and water right purchase must take place about every 5 years. Major concerns for Texico include water quality declines and the rising cost and availability of using ground water for M&I water supply. Texico indicated that it may be possible to complete a joint water supply project with Clovis, but no formal discussions have taken place (Cooper, pers. comm. 2008).

CAFB. CAFB's existing system of six wells provides drinking water, irrigation water, and nonpotable water for other CAFB activities. Normally CAFB operates only two of its six wells, which have adequate capacity to meet water demands. Because of the size of CAFB, other wells could be permitted and drilled. CAFB has no other reasonable options for drinking water other than ground water except for the Proposed Action. Ground water levels appear to be dropping 2 to 3 feet per year and unquantified drops in production also have occurred. Options for using deep brackish ground water also have been discussed, but no research has been completed to date. It may be possible to complete a joint water supply project with Clovis, but no formal discussions have taken place (Rebman, pers. comm. 2009).

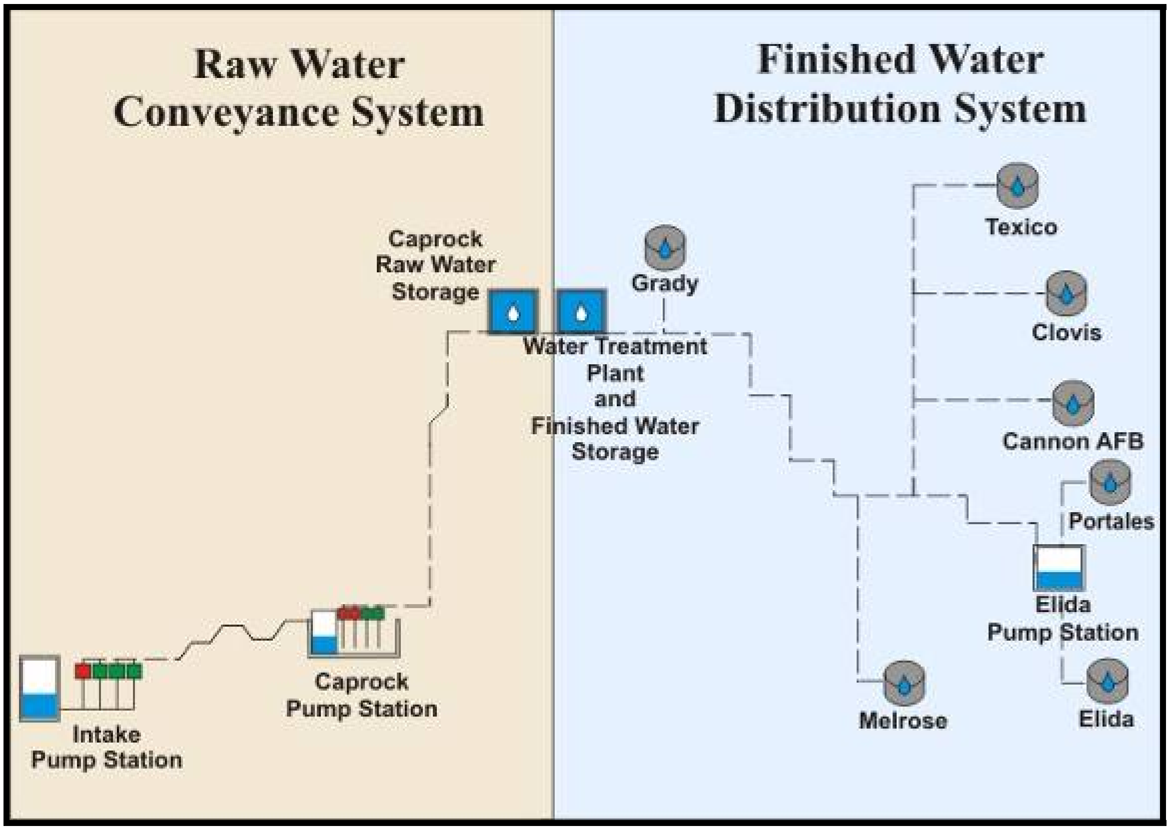
In summary, the No Action Alternative would require the Participating Communities to continue to upgrade the existing ground water supply system by drilling new wells, purchasing and converting existing agricultural wells and water rights, constructing new water treatment facilities, and investing in other infrastructure.

2.2 Proposed Action

Under the Proposed Action, Reclamation would transfer funds appropriated by Congress to the ENMWUA. The ENMWUA would use federally-appropriated funds to construct a peak-day 30-million-gallons-per-day (mgd) delivery system from the Ute Reservoir to the Participating Communities. The Project would be operated and maintained by the ENMWUA using funding from the Participating Communities and in coordination with the UWC and NMISC, once it is constructed. Design information for the Proposed Action was taken from Preliminary Engineering Reports completed by CH2M HILL in 2006; and 30 percent design documents completed in 2007, 2008, and 2009. The major system components include the following (Figure 5 and Figure 6):

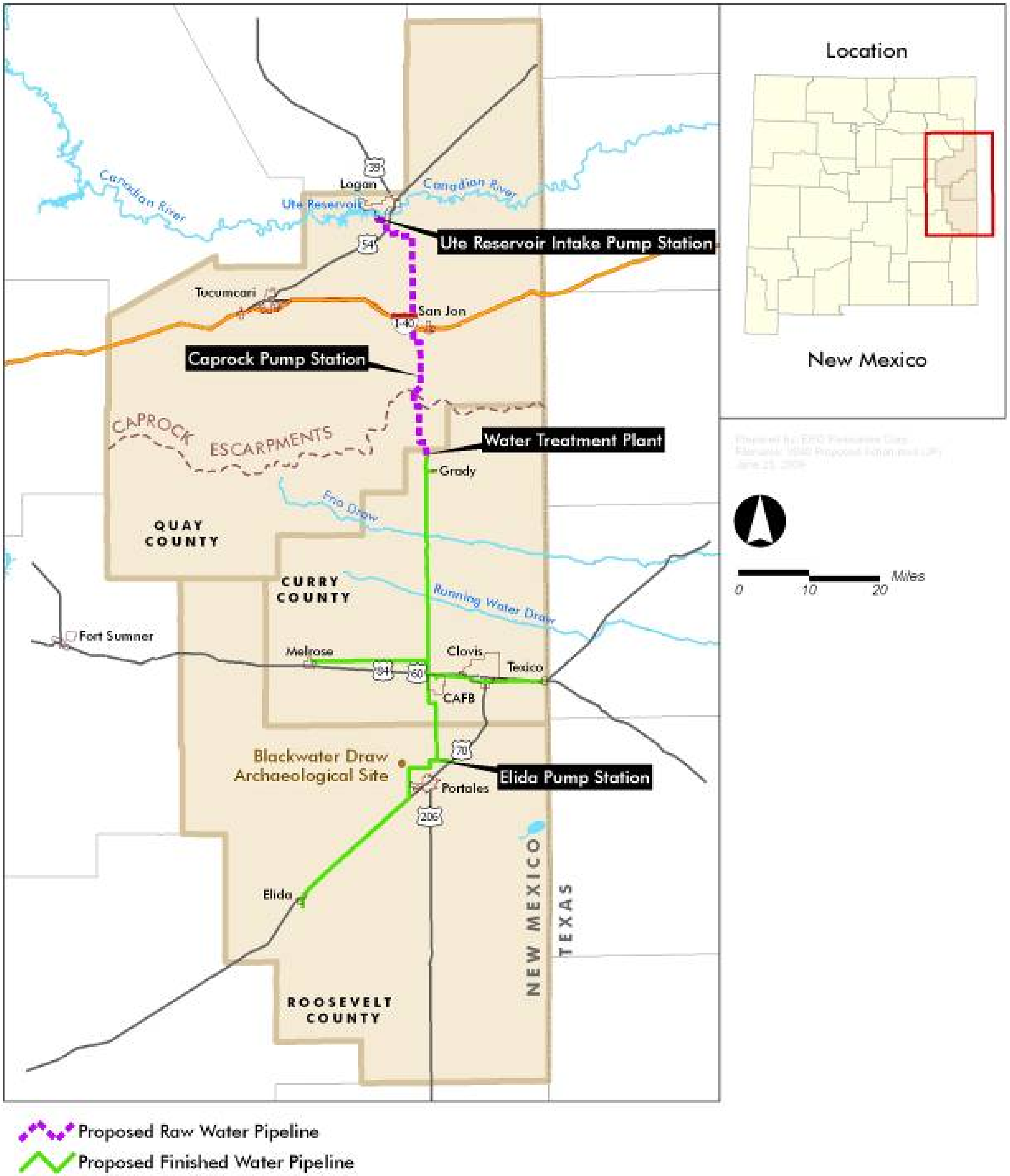
- Raw water intake, conveyance, and storage;
- Water treatment; and
- Finished water storage and conveyance.

Figure 5. Proposed Action Alternative Conceptual Diagram.



Source: Adapted from CH2M HILL 2006a.

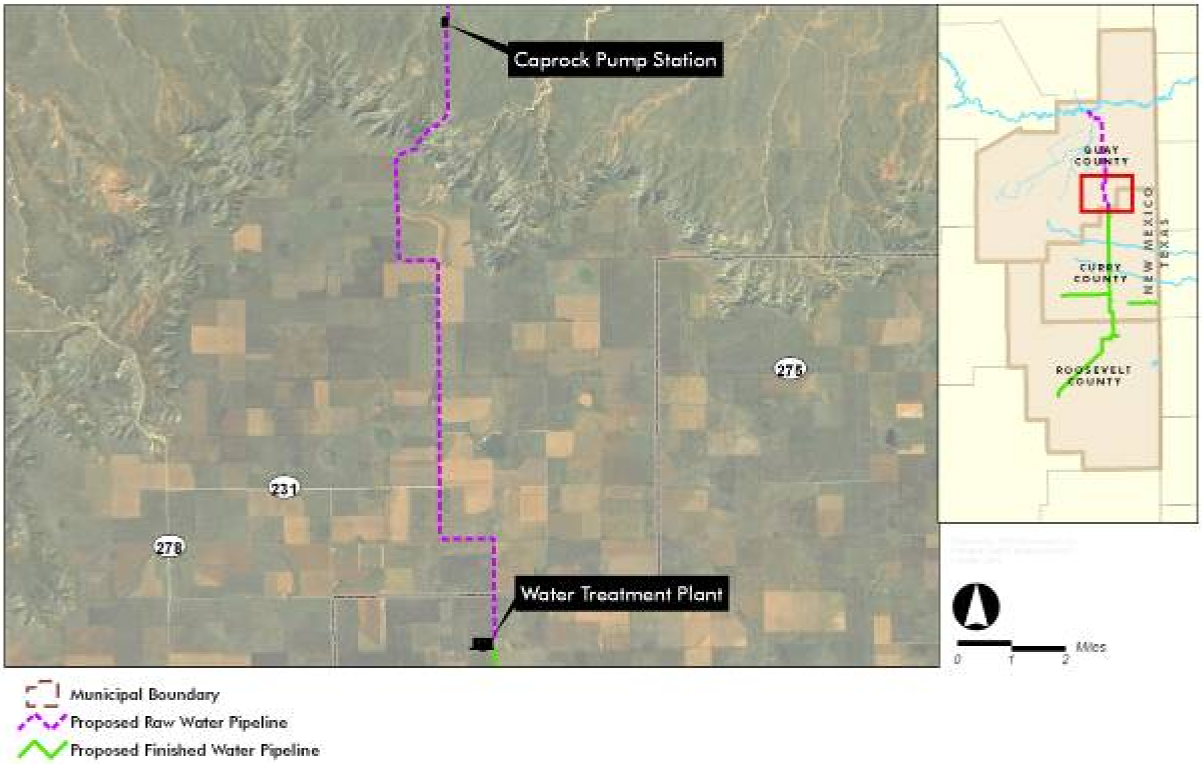
Figure 6. Proposed Action Location.



Ute Reservoir would act as the intake pump station forebay (Figure 7). The intake structure would allow for the future withdrawal of the Quay County entities UWC allocations; delivery systems for those allocations are not planned or permitted at this time. The Proposed Action would include raw water storage at two locations (Caprock pump station and the top of the Caprock escarpment (the Caprock)) and finished water storage at the water treatment plant (WTP), with a 30-mgd peak-day capacity. The Participating Communities would use their existing finished water storage facilities for final storage. Pump stations would be located at the reservoir and at the base of the Caprock to convey raw water to the WTP (Figure 8). A small pump station would lift finished water to Elida. The type and size of conveyance piping would vary, with large diameter pipes for mainline conveyance (42- to 48-inch) down to 4- to 12-inch lateral lines for delivery to each Participating Community. Major highways and railroad crossings would be constructed by boring (auger boring or directional drilling). Creek crossings would be completed during low flow and would be open trenched, with the exception of Revuelto Creek, which would be bored.

Figure 7. Location of Proposed Ute Reservoir Intake Pump Station.

Figure 8. Location of Caprock Pump Station and Water Treatment Plant.



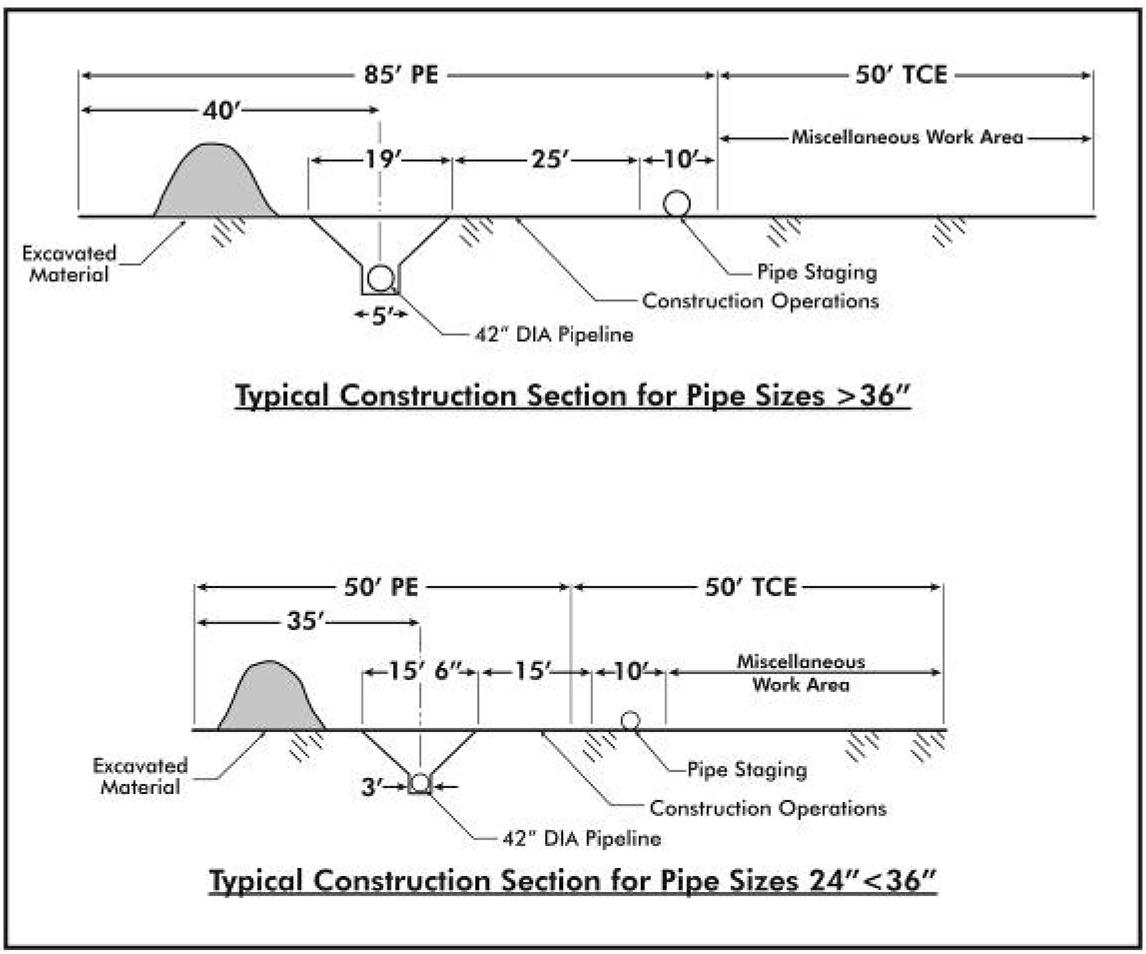
Electrical infrastructure would require upgrades and additional service lines. About 10 miles of new or upgraded distribution lines would be required, and two substations would require upgrading (San Jon and Grady substations). One new substation may be required to serve the intake pump station. The ENMWUA supports the construction of a wind energy project, or other potential renewable, in conjunction with the pipeline project. The Authority has invested significant time and money in exploring wind energy options, including three separate studies:

1. Wind Energy Feasibility Study (November 2005; updated January 2006)
2. Wind Project Site Reconnaissance Study (February 12, 2007)
3. Phase II Wind Energy Project Feasibility Study Final Report (March 23, 2007)

The Authority concluded that a large wind project is financially feasible and well-suited to the Authority and potential partners, but that there are significant constraints. The main constraint to a wind project is the capacity of existing transmission lines near the project area. According to the 2007 Final Report, “interconnections in eastern New Mexico have a comparatively low capability to transmit power…probably capable of transmitting no more than about 50 MW of generation.” There is a good deal of interest in upgrading connections and substations in this area, and the Authority is actively keeping up-to-date on developments that would allow a wind power project near the pipeline to become feasible. Because of intermittency issues, it is not possible to tie the proposed wind project directly to project facilities as a primary power supply.

New permanent access roads would be required to access permanent facilities, including the intake facilities at Ute Reservoir, booster stations and water storage tanks, and the WTP. Primary access roads would have a 24-foot paved surface and 5-foot gravel shoulders (total 34-foot width). Secondary access roads would have gravel surface with a total width of 15 ft. Temporary access roads would be required where the pipeline route does not adjoin existing roads. Permanent and temporary easements would be required for pipeline construction (Figure 9). Permanent and temporary easement agreements and license agreements with NMISC and other landowners would be required. For pipe diameters 36 inches or greater, a 50-foot temporary easement and an 85-foot permanent easement would be needed (total of 135 ft). For pipe diameters less than 36 inches, 50-foot permanent and temporary easements would be required (total of 100 ft).

Figure 9. Typical Permanent and Temporary Construction Easements.

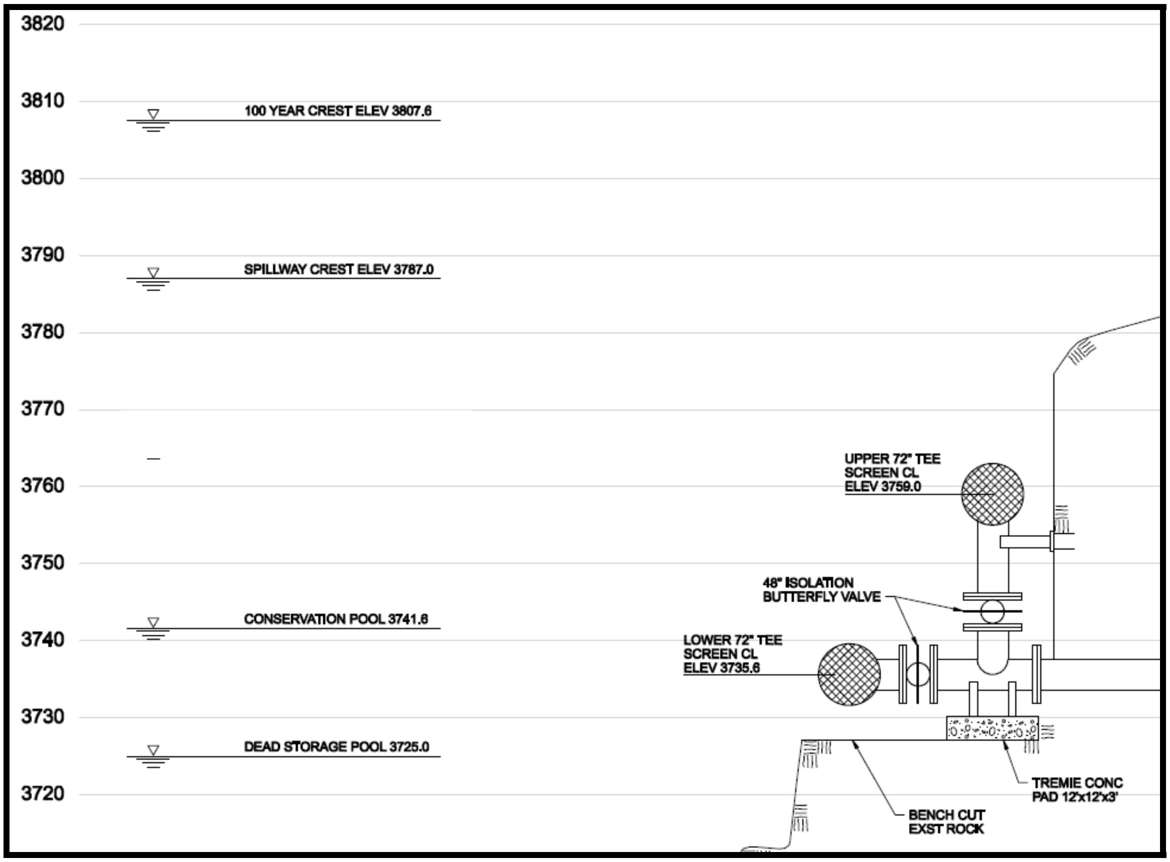


2.2.1 Raw Water Intake, Conveyance, and Storage

The intake pump station would be located along the south side of Ute Reservoir, approximately 2 miles west of U.S. Highway 54 along South Shore Drive (Figure 7). The intake structure would consist of an upper screened “Tee” at an elevation of 3,759 ft and a lower screened “Tee” at elevation of 3,735 ft (below the level of the Conservation Pool at 3,741 ft; see Figure 10). The screens on the “Tees” would prevent fish and debris from entering the intake. The screen size (1/8th inch), intake velocity (<0.5 feet per second), and approach velocity (0.21 feet per second) are sufficient to minimize any potential impacts to the fisheries of Ute Reservoir (NOAA 1995). The intake structure would be sized to accommodate withdrawals up to the maximum annual volume reserved by the UWC (24,000 afy); however, only 16,450 afy is part of the project. The maximum withdrawal for the ENMRWS is 16,450 afy.

The intake structure would divert water to a 48-inch diameter raw water pipeline, which would convey the water to the intake pump station. The intake pump station would pump the water to the booster pump station, which would be approximately 4 miles south of Interstate 40 (I-40) along State Highway 39. The footprint of the intake structure and pump station would be about 3 acres. From the booster pump station, the raw water would be conveyed by 36- to 42-inch-diameter raw water pipeline to a storage facility on the Caprock. About 41 miles of raw water pipeline would be installed. Use of escape ramps during pipeline construction, and closure of the trench as soon as possible following pressure-testing, would minimize trapping of wildlife during trenching operations. In addition, all temporary disturbance areas would be seeded after final grading is complete.

Figure 10. Schematic of Intake Structure.



2.2.2 Water Treatment

The WTP design and method is capable of meeting current and anticipated drinking water quality regulations. This design was based on results obtained from treatability testing from Ute Reservoir water samples, known existing and potential future source water quality issues, and proposed finished water quality goals (CH2M HILL 2006b, 2006c, 2006d, 2006e; Table 4). The WTP would be located near the northernmost Participating Community, Grady (Figure 2 and Figure 8), and would require about 34 acres. The WTP would be a conventional coagulation plant with the following characteristics and components:

- Net production capacity of 28 mgd, with minimum plant flow of 5 mgd, and average treated water flow of 15 mgd;
- Two parallel rapid mix, flocculation, sedimentation, and ozonation process trains;
- Combined filtration through six parallel granular media filters;
- Disinfection using a chlorine/ammonia system;
- Solids setting and landfill disposal (about 3,000 cubic yards per year); and

- Finished water storage capacity of 10 million gallons.

Table 4. Water Treatment Plan Process, Benefits, and Goals.

Unit Process	Process Benefit	Targeted Finished Water Quality Goal
Rapid mix	Destabilization of dissolved organic carbon (DOC) and turbidity	Turbidity; disinfection by-product precursors
Flocculation	Flocculation of destabilized particles into settleable floc	Turbidity; disinfection by-product precursors
Sedimentation	Settling of particles	Turbidity; pathogens; disinfection by-product precursors; manganese; iron
Ozonation	Provide disinfection; oxidize DOC, soluble iron and manganese, and taste and odor; and prepare water for biological filtration	Pathogens, taste and odor, disinfection by-product precursors, iron, manganese
Biological filtration	Removal of particles, DOC, taste and odor, and pathogens	Turbidity, pathogens, taste and odor, disinfection by-product precursors, iron, manganese, finished water biological stability
Finished water chemistry adjustment	Provide finished water stability	Finished water pH and alkalinity
Sodium hypochlorite and aqueous ammonia addition	Provide disinfection and chlorine residual	Pathogens, chlorine residual

Source: CH2M HILL 2006c.

2.2.3 Finished Water Conveyance and Storage

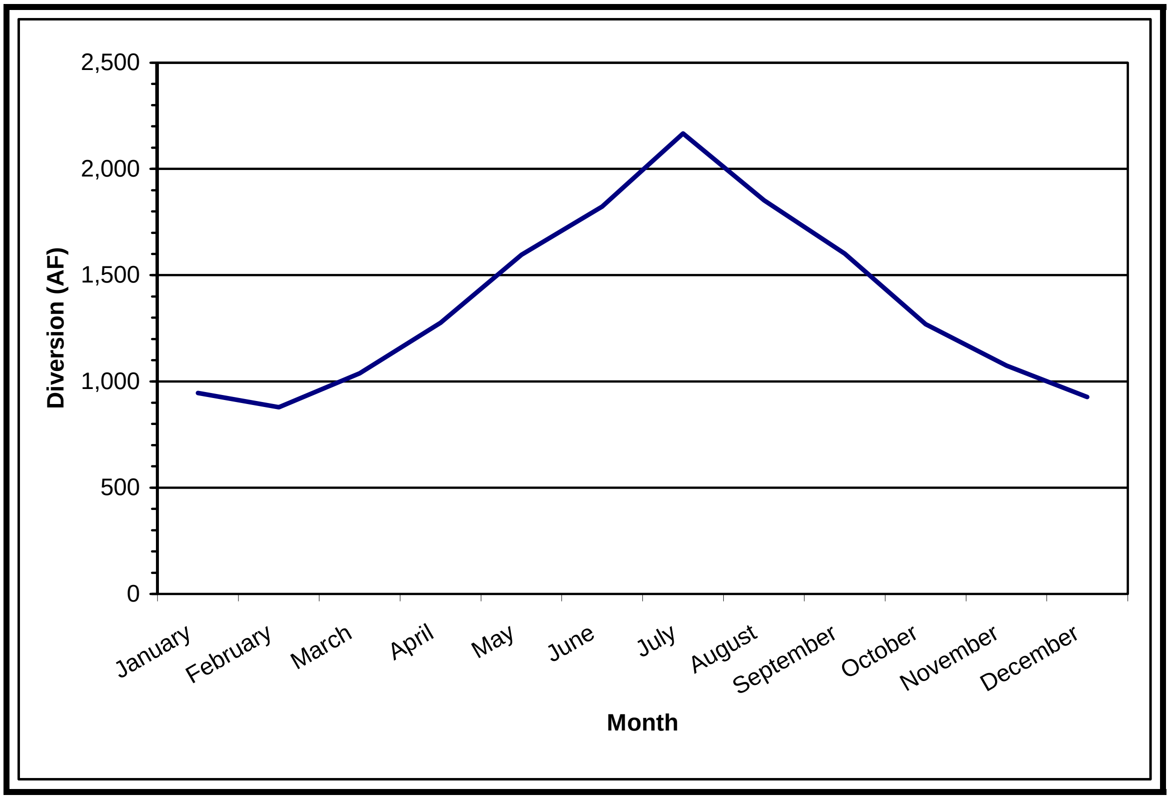
Most of the finished water system would be gravity fed since the Participating Communities are lower in elevation than the WTP. However, two booster pump stations (about 2 to 4 acres) would be needed to deliver water to the Participating Communities. Each of the Participating Communities would use existing storage facilities. About 113 miles of finished water pipeline, including community laterals, would be installed. Use of escape ramps during pipeline construction, and closure of the trench as soon as possible following pressure-testing, would minimize trapping of wildlife during trenching operations. In addition, all temporary disturbance areas would be seeded after final grading is complete.

2.2.4 Pumping and Operation

The annual maximum withdrawal from Ute Reservoir for the Project would be 16,450 AFY, which is the total volume of water reserved by the Participating Communities. Maximum monthly withdrawals were developed by distributing the total annual withdrawal based on historical monthly water use by ENMWUA members from 1993 to 1998 (Smith Engineering Company 2003). The maximum monthly withdrawal schedule for the Project is shown in Figure

11, and the approximate allocation among the Participating Communities is shown in Table 5. Actual Ute Reservoir withdrawals may be lower than the demands shown depending on hydrologic conditions and actual demands from the Participating Communities.

Figure 11. Maximum Monthly Diversions under the Proposed Action.



Source: Smith Engineering Company 2003.

Table 5. Participating Communities Water Use, Future Demand, and Water Reservation.

Participating Community	Current Water Use (AFY)	2060 Demand Estimate (AFY)[1]	Water Reservation (AFY)
City of Clovis	6,162	8,988	12,292[2]
Town of Elida	49	74	50
Village of Grady	21	27	75
Village of Melrose	141	203	250
City of Portales	4,217	4,523	3,333
City of Texico	171	293	250
CAFB	1,121	1,706	-
Curry County	1,013	1,188	100

Participating Community	Current Water Use (AFY)	2060 Demand Estimate (AFY)[1]	Water Reservation (AFY)
Roosevelt County	1,776	-	100
Totals	14,671	17,002	16,450

[1] Demand estimates for Roosevelt County are incorporated into other entities.

[2] Includes CAFB.

Note: Some Participating Communities have reserved water in excess of their current and forecasted water needs, while some have reserved less. It is possible for the communities to reallocate or sublease their water allocation to balance community needs.

Source: CH2M HILL 2006b.

2.2.5 Construction, Reclamation, and Operation Practices

Construction, reclamation and operation practices have been developed to minimize and avoid adverse effects as much as possible. The practices can be divided into two phases—construction and operational phases. The following practices would be implemented during project construction and reclamation:

- To minimize impacts to migratory birds (protected under the Migratory Bird Treaty Act), as much tree and brush clearing in the construction corridor as possible would occur outside of the active nesting season (during September to March). If clearing must occur during the active nesting season, surveys would be conducted to identify active nests that would be impacted during clearing and construction. Disturbance to active nesting areas would be avoided.
- To minimize the impact of construction-related spills, a Spill Prevention, Control and Countermeasure plan or related document/construction specifications would be developed.
- Temporarily disturbed areas would be reseeded after final grading is complete. The seed mix would be composed of native species, with any non-native cover crops being non-invasive annuals or sterile species.
- Measures to eliminate or minimize impacts to the lesser prairie chicken include coordinating with NMDGF to complete surveys where necessary, to identify active leks or nests in the project area. ENMWUA would also coordinate with the NMDGF to implement necessary timing restrictions for pertinent pipeline sections. Measures to protect migratory birds (see bullet #1 above) would also protect the lesser prairie chicken.

The following practices would be implemented during project operation:

- Arkansas River Shiner Management Plan measures to maintain flow and habitat in the Canadian River would be implemented by NMISC and other agencies signatory to the Plan, and supported by Reclamation.
- Consultation with the U.S. Fish and Wildlife Service regarding threatened and endangered species is complete. The NMISC has committed to monitor the fishery below the Ute Dam, modify the Ute Dam outlet works, install a more accurate measurement of flow downstream of the Ute Dam, and coordination of Compact releases with the Service.

2.3 Alternatives Considered, but Eliminated from Detailed Analysis

Several other alternatives with Ute Reservoir as a water source were considered but eliminated, including an alternative WTP location and different water storage options (aquifer storage and open surface water storage). The Project represents the most cost-effective, efficient alternative to constructing a pipeline system and using this surface water resource. Other pipeline alignments also were considered, but eliminated. The current proposed action avoids active playa lakes in the project area to protect this resource.

Use of a deep brackish ground water aquifer also was considered but eliminated from detailed analysis. Using brackish ground water has significant drawbacks, including drilling and treatment cost, low per-well yield, and environmental impacts of evaporation ponds and brine disposal. In addition, brackish ground water is a limited nonsustainable resource and, therefore, does not meet the purpose and need for the Project. To meet the demands of the Participating Communities, the brackish ground water alternative would require:

- About 286 new wells over the 55-year planning period;
- Raw and finished water distribution system;
- Water treatment for TDS concentrations ranging from 5,000 to 10,000 milligrams per liter (mg/L), possibly as high as 60,000 mg/L, as well as a potential water treatment solution for radium;
- Evaporation/concentration facilities/ponds for saline waste water; and
- Brine by-product disposal options.

Additional details regarding alternatives considered are in CH2M HILL's December 2, 2005 *Fresh and Brackish Groundwater Resources in the ENMRWS Project Area Technical Memorandum* (2006d).

Table 6 provides a summary of resource impacts from the No Action Alternative and Proposed Action.

Table 6. Summary of Impacts of the Alternatives.

Resource	Effect of the No Action Alternative*	Effect of the Proposed Action
Ute Reservoir Storage	None*	Reduced storage as a result of Project withdrawals
Canadian River Streamflow	None	Reduced infrequent short-term high flows from reservoir releases/spills at maximum 325 cfs, but no effect on constant baseflow

Resource	Effect of the No Action Alternative*	Effect of the Proposed Action
Ground Water	Reduced ground water levels and potential pumping rates for the Ogallala aquifer	Small decrease in decline in ground water levels as a result of decreased M&I demands from the Ogallala aquifer
Geomorphology	None	Decrease in sediment transport capacity at infrequent short-term high flows associated with reservoir releases/spills; potential small increase in riparian vegetation growth and reduced channel capacity between the Ute Dam and Revuelto Creek confluence
Ute Reservoir Water Quality	None	Decreased stratification for Ute Reservoir as a result of lower storage levels; fewer and shorter low dissolved oxygen events, and less phosphorous releases from reservoir sediments; shorter reservoir residence time; could result in less algae growth
Canadian River Water Quality	None	Reduction in infrequent short-term low TDS dilution flow from Ute Reservoir releases, resulting in fewer low TDS streamflow events, but no change to constant baseflow water quality
Ground Water Quality	Potentially degraded water quality in Ogallala aquifer supply as aquifer water levels decline	None
Recreation (Curry and Roosevelt Counties)	Reductions in “discretionary uses” such as irrigation of parks and golf courses	Potential improvements in recreation due to stable long-term water supply
Recreation (Quay County)	Reservoir levels would remain in historic range, with water levels below 3,777 feet elevation every 5 years*	Declines in Ute Reservoir water level could affect recreation with water levels below 3,777 feet in elevation every 2 years on average; potential 6 percent decline in visitation, depending on conditions at nearby reservoirs; impacts to usability of boat docks

Resource	Effect of the No Action Alternative*	Effect of the Proposed Action
Socioeconomics: Economic Conditions (Curry and Roosevelt Counties)	Economic development declines; loss of existing businesses and residents; increased water costs	Increased water costs; in long term, Proposed Action would have costs about 7 percent lower than the No Action Alternative
Socioeconomics: Economic Conditions (Quay County)	Potential impacts due to declining economic conditions in Curry and Roosevelt counties)	Short-term economic benefits from construction of about $4 million per year; 6 percent decrease in recreation visits at Ute Reservoir could result in decreased revenues of about $1 million per year and could affect 19 full- and part-time jobs
Socioeconomics: Property values	Potential declines in property values in Curry and Roosevelt counties due to water supply cost and uncertainty	Potential declines in property values with locational premiums adjacent to Ute Reservoir at low water levels, depending on locations and steepness of shoreline
Threatened and Endangered Species	No change to habitat for interior least tern, lesser prairie-chicken, or shiner*	No effect to tern; minimization and avoidance for lesser prairie-chicken; decrease in duration and frequency of Compact releases could increase riparian vegetation between the Ute Dam and Revuelto Creek confluence
Vegetation and Wetlands	Potential impacts to surface vegetation from new ground water wells/well fields	Approximately 44 acres of permanent vegetation impacts; about 0.5 acres temporary wetland impacts
Wildlife	Potential impacts to habitat from groundwater wells/well fields	Permanent impacts to about 37 acres of short-grass prairie habitat, and 6.5 acres of mesquite mid-and short-grass prairie; impacts to other habitat types would be short-term; impacts to open juniper woodlands would be semipermanent due to slow regeneration of woodlands; temporary construction impacts from noise and human activity
Geology, Soils, Air Quality, and Climate	Potential impacts due to groundwater well/well field drilling	Temporary soil disturbance during construction; potential increase in fugitive dust; about 310 acres of temporary impacts to soils classified as “Prime if Irrigated”

Resource	Effect of the No Action Alternative*	Effect of the Proposed Action
Cultural Resources, Indian Trust Assets, and Environmental Justice	No impacts to cultural resources or ITAs; impacts to Portales are potentially an environmental justice concern because of the lower than average income in that community	Any eligible sites would be mitigated as approved by SHPO; no ITAs in Project Area; no environmental justice concerns

*For the purposes of this EA, the No Action Alternative assumes a continuation of existing conditions in Ute Reservoir. However, in the absence of the Project, the State would likely pursue other purchasers for Ute Reservoir water.

Chapter 3. Affected Environment

Chapter 3 is a description of the environmental setting for the Proposed Action. Each part of the environmental setting that could be affected by either the No Action Alternative or the Proposed Action is discussed, and resources related to important issues brought up during scoping have more detailed sections. Those resources that would not be affected, or that would have effects that could not be measured, are described only briefly. The information in this EA was summarized from various resource studies and technical reports (see the list of Technical reports; Appendix B).

3.1 Hydrology

The surface water hydrology Project Area includes Ute Reservoir, the Canadian River downstream of Ute Reservoir to the state line, and sections of Revuelto Creek, Running Water Draw, Frio Draw, and Blackwater Draw. The ground water hydrology Project Area is the aquifer extent of both the Ogallala and other regional aquifers within Quay, Curry, and Roosevelt counties, particularly near the Participating Communities. Information on hydrologic conditions in the Project Area was gathered from a variety of sources including federal, state, and local agencies; and state and regional organizations. The analysis includes surface water hydrology, water quality, geomorphology, and ground water hydrology. The hydrology analysis focused on the important issues and concerns that citizens and agencies brought up during the public scoping meetings in August 2007, and throughout the EA process. Additional details are in the *Hydrology Affected Environment Report*, *Ground Water Technical Report*, *Hydrology Effects Analysis Report*, and *Water Quality Technical Report (*MWH 2008, 2009a, 2009b, 2009c).

3.1.1 Surface Water

Information from the following sources was used to document the affected environment for surface water hydrology and fluvial geomorphology:

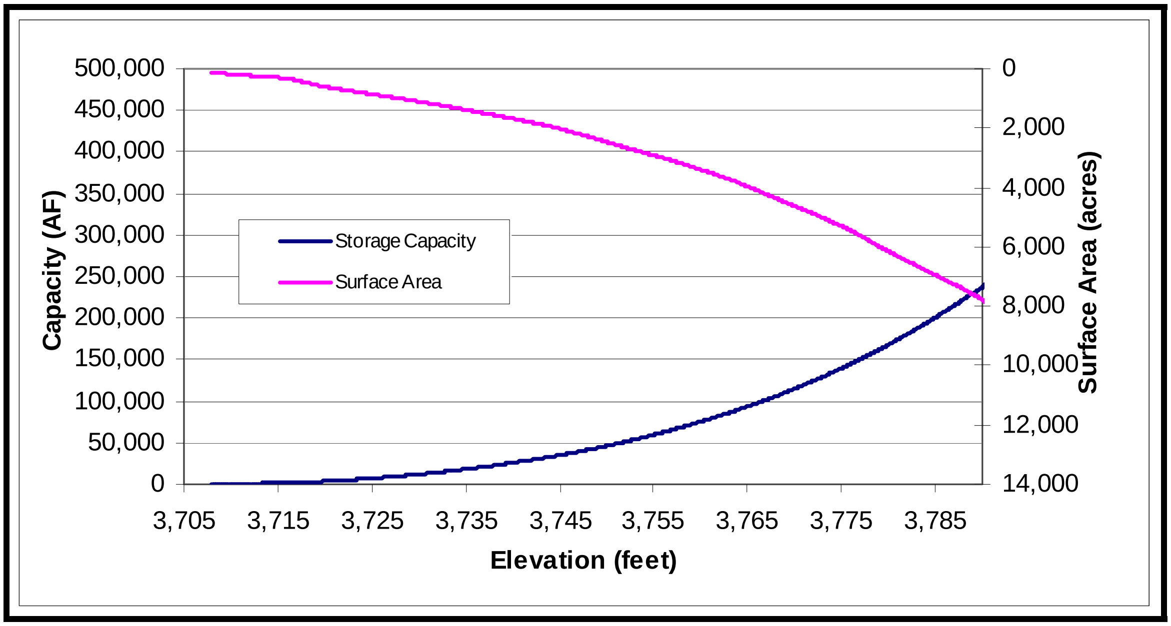
- Historical daily records of Ute Reservoir stage, storage volume, and surface area from the NMISC;
- Historical daily streamflow records for the USGS Canadian River streamgage at Logan gage (#07227000) for the available period of record (1909 to 2006 with sporadic missing data);
- Historical daily streamflow records for the USGS Revuelto Creek streamgage near Logan gage (#07227100) for the available period of record (2007 to 2008 with sporadic missing data);
- Summary of 1965 to 2007 historical Ute Reservoir storage volume, surface area, and elevation from the NMISC (CH2M HILL 2007; NMISC 2008);
- Summary of existing geomorphic conditions for the Canadian River downstream of Ute Reservoir based on field observations and photographs; and
- Review of historical aerial photographs to determine past changes in stream channel planform and channel stability.

Two policy documents and compacts govern use of surface water in the Project Area—the Canadian River Compact signed by New Mexico, Texas, and Oklahoma on December 6, 1950 and modified by Supreme Court Decree; and the Management Plan signed by many entities and agencies (including the Service) in 2005. The Compact is discussed in Chapter 1, and the Management Plan is discussed in Section 3.3.3. The Compact and Management Plan affect levels in Ute Reservoir by restricting storage to the Compact maximum and requiring constant baseflow of 3 to 5 cubic feet per second (cfs) in the Canadian River. These agreements also affect flows in the Canadian River from the perspective of Compact spills and the baseflow requirement of 3 to 5 cfs. The State is allowed storage in Ute Reservoir up to the Compact maximum, and any inflows that would increase the storage above that amount must be released or "spilled."

3.1.1.1 Ute Reservoir

In 1962, Ute Reservoir was originally completed with a total capacity of 110,000 AF at a spillway crest elevation of 3,760 feet. In 1984, the reservoir was expanded by raising the spillway to 3,787 feet, which increased the amount of water the reservoir could store to approximately 245,000 AF. The reservoir was designed to provide conservation storage (i.e., capacity available for a variety of uses, including domestic, M&I, and irrigation; and excluding flood control, power production, and sediment control). Bathymetric surveys, which are surveys of underwater elevations, are completed approximately every 10 years to determine the effect of sediment inflow to the reservoir. Sediment inflow decreases the amount of water that can be stored in the reservoir over time. In 2002, the last bathymetric survey was completed, and maximum storage capacity at that time was estimated at about 215,100 AF. Assuming the average storage capacity continues to decline throughout the 2060 planning horizon, the Ute Reservoir capacity would be approximately 159,000 AF in 2060. In addition to storage, the elevation of the reservoir corresponds to surface area (Figure 12).

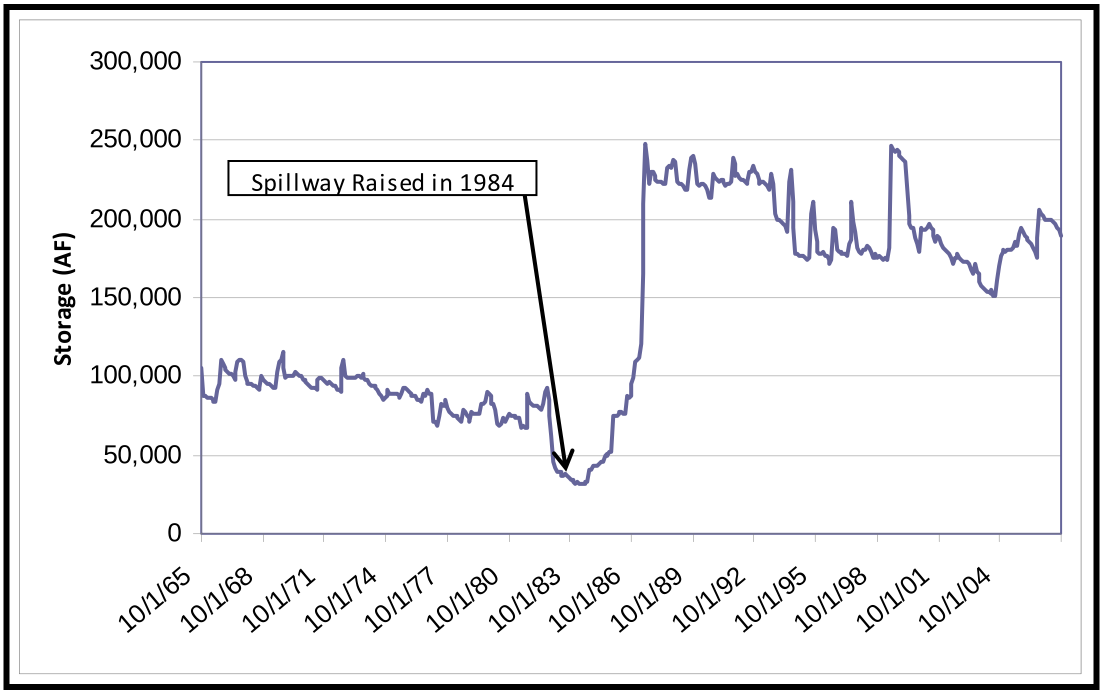
Figure 12. Ute Reservoir Area-Capacity Curve (2002).



Source: MWH 2008.

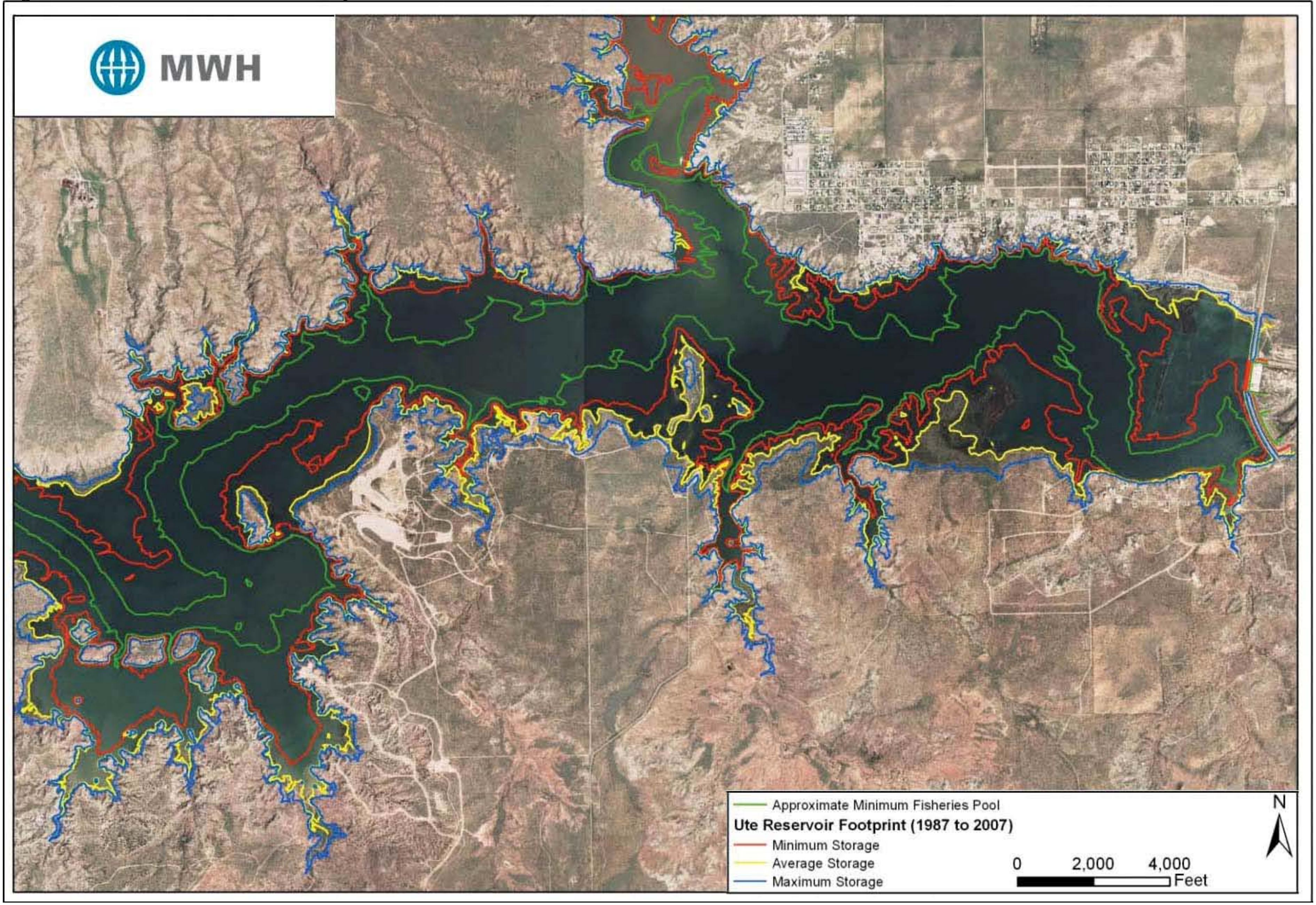
The amount of water stored in Ute Reservoir has remained fairly constant since the spillway was raised in 1984. Since Ute Reservoir was built in 1962, water has not been diverted per the reservoir's intended use as a M&I water supply, with the exception that 12 Shores at Ute Lake has been authorized to temporarily use about 800 AFY for construction-related dust suppression. The reservoir is kept as full as possible, in compliance with the Compact, and the variations in storage result from changes in precipitation and evaporation losses. Figure 13 shows storage in the reservoir from 1965 to 2008, and Figure 14 shows minimum, average, and maximum historic reservoir footprints from 1987 to 2007.

Figure 13. Historical Ute Reservoir Storage.



Source: MWH 2008.

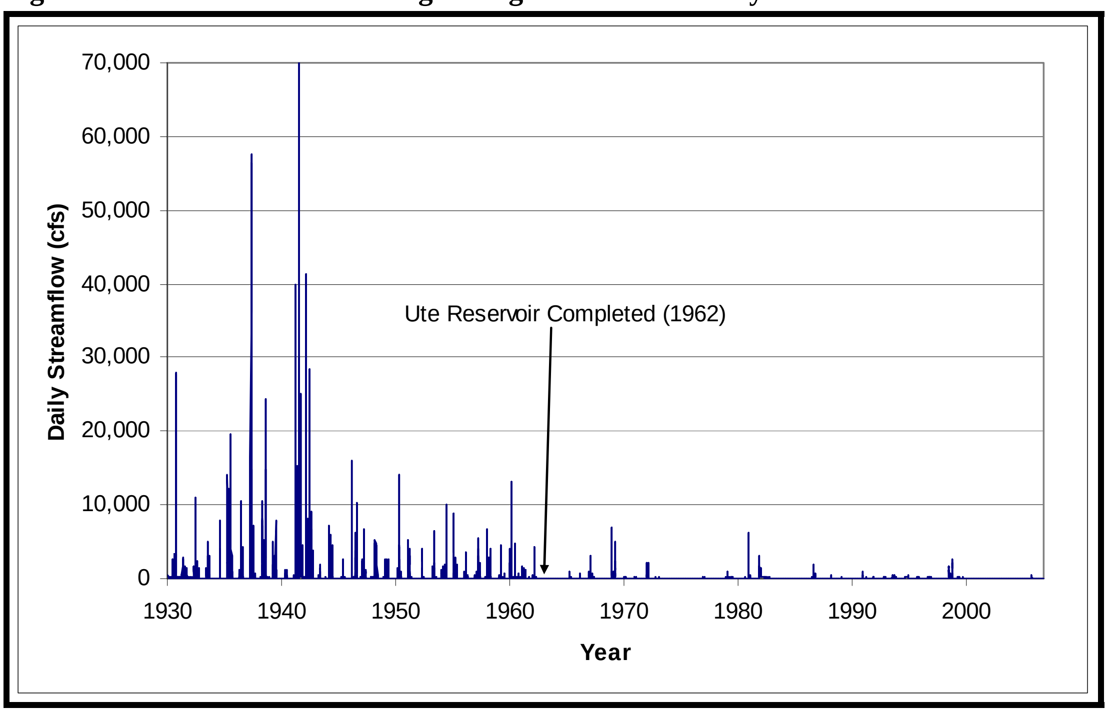
Figure 14. Ute Reservoir Historic Footprints for 1987 to 2007 and Minimum Fisheries Pool.



3.1.1.2 Canadian River

Historical streamflow in the Canadian River from Ute Reservoir to the state line can be divided into two periods: prior to Ute Reservoir construction in 1962 and the period following completion of the reservoir. The USGS streamgage, Canadian River at Logan gage, NM (#07227000), located immediately downstream of the Ute Reservoir dam, is used to represent Canadian River streamflow downstream of Ute Dam for the surface water studies in this report. A time series showing historical daily streamflow for the Canadian River for the 1930 to 2007 period of record (1909 to 1929 data are not plotted because of missing data) is provided in Figure 15. The figure shows that average daily streamflow varied from 0 to 70,000 cfs, with a median daily flow of about 14 cfs before Ute Reservoir was constructed, and has ranged from 0.1 to 6,860 cfs, with a median daily flow of about 3 cfs during the 1964 to 2007 period. Canadian River streamflow downstream of the reservoir is composed of seepage from or beneath Ute Dam, contributions from alluvial ground water, and rainfall runoff, with occasional short-term high flows originating from Ute Reservoir releases associated with the Compact. Compact releases to Canadian River streamflow are unpredictable. The most recent releases for Compact compliance were in September 2006 and Spring 2000.

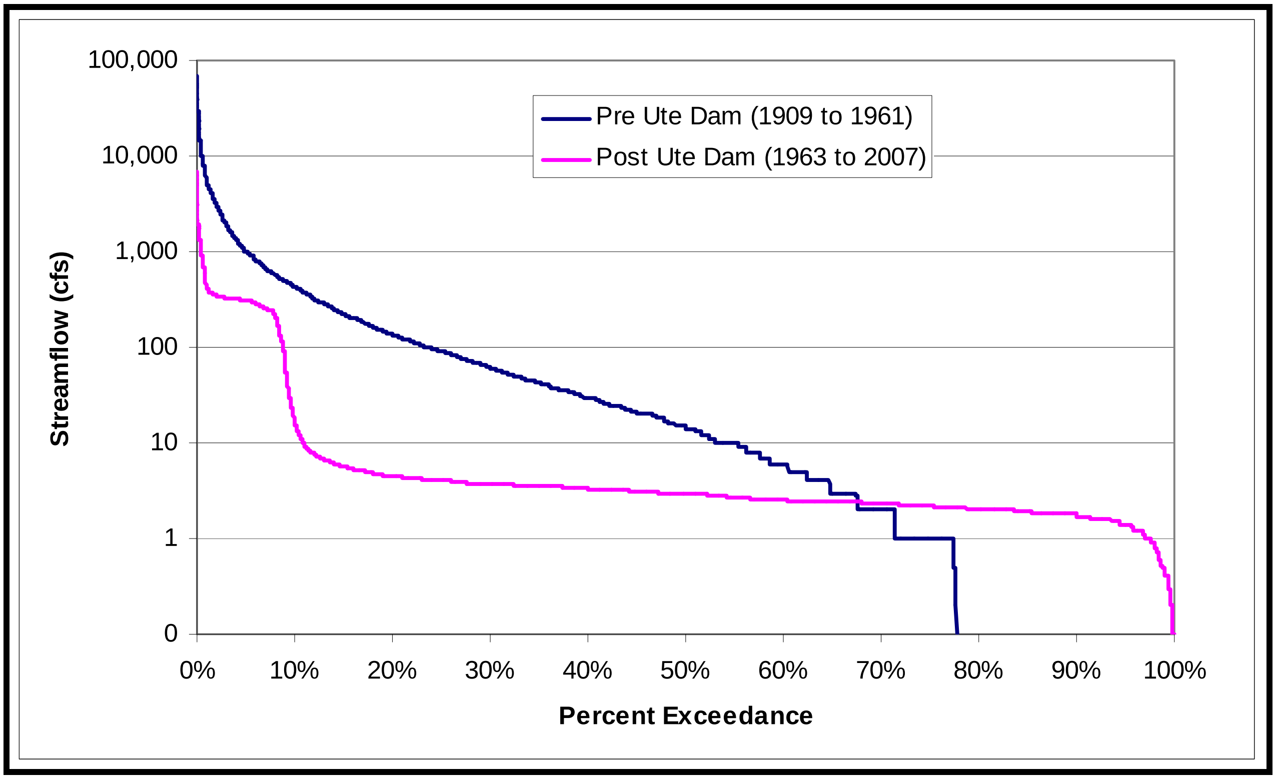
Figure 15. Canadian River at Logan Gage – Historical Daily Streamflow.



Source: MWH 2008.

Streamflow exceedance curves for historical daily streamflow for pre- and post-Ute Reservoir periods are shown in Figure 16. The exceedance curve summarizes the streamflow values compared to the percentage of time each value is equaled or exceeded. For example, 33 percent of the time, pre-dam streamflow was greater than or equal to 50 cfs; and 33 percent of the time, post-dam streamflow has been greater than or equal to 3.6 cfs. The exceedance curves generally show that streamflow was more variable prior to construction of Ute Reservoir than after the dam was completed in 1962. The relatively flat line shown in Figure 16 for the post-dam period from about 25 to 85 percent exceedance (corresponding to 2 to 4 cfs) is indicative of the baseflow that has occurred in the Canadian River downstream of the Ute Dam since its construction. The baseflow of 2 to 4 cfs is consistent with the median streamflow of 3 cfs for the post-Ute Dam period described above.

Figure 16. Canadian River at Logan Gage – Historical Streamflow Exceedance Curves.



Source: MWH 2008.

Canadian River streamflow increases downstream from Ute Dam to the state line as a result of contributions from ground water, rainfall runoff, and surface tributaries. Revuelto Creek flows into the Canadian River about 7 miles downstream of the Ute Dam and contributes baseflows of about 0.4 cfs. Revuelto Creek also contributes flood flows because it is not a controlled drainage (i.e., is not dammed). Flow information for Revuelto Creek has only been collected for the period August 2007 to August 2008. During that period, the peak flow was 2,150 cfs.

Canadian River streamflow at the state line is likely higher than at the Logan gage because of the influence from ground water discharge and rainfall runoff to the Canadian River and its tributaries. Flow information from a USGS gage at Amarillo was used to interpolate a median state line flow of about 101 cfs.

3.1.1.3 Revuelto Creek

Streamflow data were obtained for Revuelto Creek, the largest tributary to the Canadian River within the Project Area, at the Revuelto Creek near the Logan gage (#07227100). The drainage area for the Revuelto Creek streamgage is approximately 790 square miles, compared to the drainage area of about 10,000 square miles for the Canadian River at Logan gage. Revuelto Creek streamflow is small, with about 50 percent of streamflow values equal to or greater than 0.4 cfs, and 10 percent of values equal to or greater than 14 cfs. The median and maximum daily streamflow on record at the gage were 0.4 cfs and 2,150 cfs, respectively.

3.1.1.4 Minor Drainages

Running Water and Frio draws in the Project Area are intermittent drainages that flow only during storm events. No gage stations are on either of these draws; therefore, no flow information is available. Blackwater Draw is a paleochannel and does not convey streamflow consistently.

3.1.2 Ground Water

Two major ground water aquifer systems occur within the Project Area—the Ogallala Formation of the High Plains Aquifer (called the Ogallala aquifer throughout this EA), and the brackish ground water aquifers that underlie the Ogallala aquifer. Smaller, localized shallow fresh water aquifers occur in Quay County, which supply ground water for M&I purposes to Tucumcari, Logan, and San Jon.

3.1.2.1 Ogallala Aquifer

The Ogallala aquifer supplies fresh water for almost all of Curry and Roosevelt counties. The Ogallala aquifer also provides water for the Village of House in Quay County. Water pumped from the Ogallala aquifer in Curry and Roosevelt counties has declined in recent years from about 449,400 AFY in 1995 to about 377,300 AFY in 2000. About 93 percent of this pumped water is used for agricultural purposes, and about 4 percent is used for M&I uses. Recharge to the

Ogallala aquifer is less than pumping every year; therefore, the water levels in the aquifer continue to decline. Water level declines correspond to decreased pumping capacity, or the amount of water that can be pumped from an individual well. Regionally, water level declines vary from about 150 feet to about 20 feet because of differences in location. Well yields also have declined from historic rates of 600 to 1,000 gallons per minute (gpm) to average yields of 300 gpm for M&I water supply wells.

Studies have tried to predict how much longer the Ogallala aquifer will produce water. The cities of Clovis and Portales have completed some detailed studies of water level declines and well capacity, and the State and the Texas Water Development Board have completed projections of water availability. These studies indicate that water levels and well capacities will likely continue to decline, and that much of the Project Area will not be able to pump from the Ogallala aquifer within the next 30 years (see Section 1.3.2, which begins on page 7).

3.1.2.2 Brackish Aquifers

Two brackish ground water bodies underlie the Ogallala aquifer—the Chinle Group and San Andres aquifers. Although these formations potentially contain large volumes of water, the water levels are deep (about 500 feet below ground surface (bgs) in the Chinle Formation). The water has high levels of TDS and radium. The Chinle Group overlies the San Andres Formation. The water level in this formation is about 2,100 feet bgs. Recharge to the brackish aquifers is very low, making these aquifers nonsustainable as a water supply. These aquifers have not been used as a water supply because they are generally assumed to be technically and economically infeasible.

A shallow brine aquifer in the lower Chinle Group is thought to flow into the Canadian River downstream of Ute Reservoir. The Lake Meredith Salinity Control Project, about 10 miles downstream of Ute Reservoir, intercepts the brine water and pumps it into deep wells in the vicinity for disposal.

3.1.2.3 Other Regional Aquifers

Tucumcari, San Jon, Logan, and other residential areas rely on regional aquifers for M&I water uses. Tucumcari's water supply comes from alluvial deposits and the Entrada Sandstone. Tucumcari's water supply is reliable, with recent reports showing water levels in about half the wells declining and the other half increasing. In some areas near Tucumcari, the alluvial deposits and Entrada Sandstone appear to be recharged by irrigation water from the Arch Hurley Irrigation District.

Logan gets its water from wells in the Santa Rosa Formation, which has a total thickness of 400 feet at the well locations north of Ute Reservoir. These wells have relatively stable water levels, and the Village of San Jon also is supplied by the Logan well field. Residential developments south of Ute Reservoir are also served by a pipeline from the Logan well field.

3.1.3 Water Quality

The Project Area for water quality includes both surface water and ground water resources. Ute Reservoir and the Canadian River are surface water resources studied for the EA, and the Ogallala and brackish ground water aquifers also were studies. Water quality standards that apply to the Project Area include drinking water standards for potable water and "designated use" standards for other uses such as irrigation, livestock, aquatic habitat, and human contact (i.e., swimming or immersion and other skin contact). Two water quality parameters—TDS and sulfate—vary between surface and ground water. Additional information about water quality standards can be found in the *Water Quality Technical Report* (MWH 2009c).

3.1.3.1 Surface Water Standards and Background

State Water Quality Standards [303(d) list]

The Canadian River and Ute Reservoir are not currently used for drinking water, but have other designated uses and associated water quality standards. NMED publishes a "303(d)" list that reports which State waters are considered impaired, or "not supporting" for their designated uses. Designated uses of the Canadian River and Ute Reservoir are:

- Canadian River (state line to Ute Reservoir): irrigation, livestock watering, marginal warmwater aquatic life, secondary contact (i.e., human contact that does not involve immersion, such as canoeing and fishing), and wildlife habitat.
- Ute Reservoir: industrial water supply, livestock watering, M&I water supply, primary contact (i.e., human immersion such as swimming), warmwater aquatic life, and wildlife habitat.

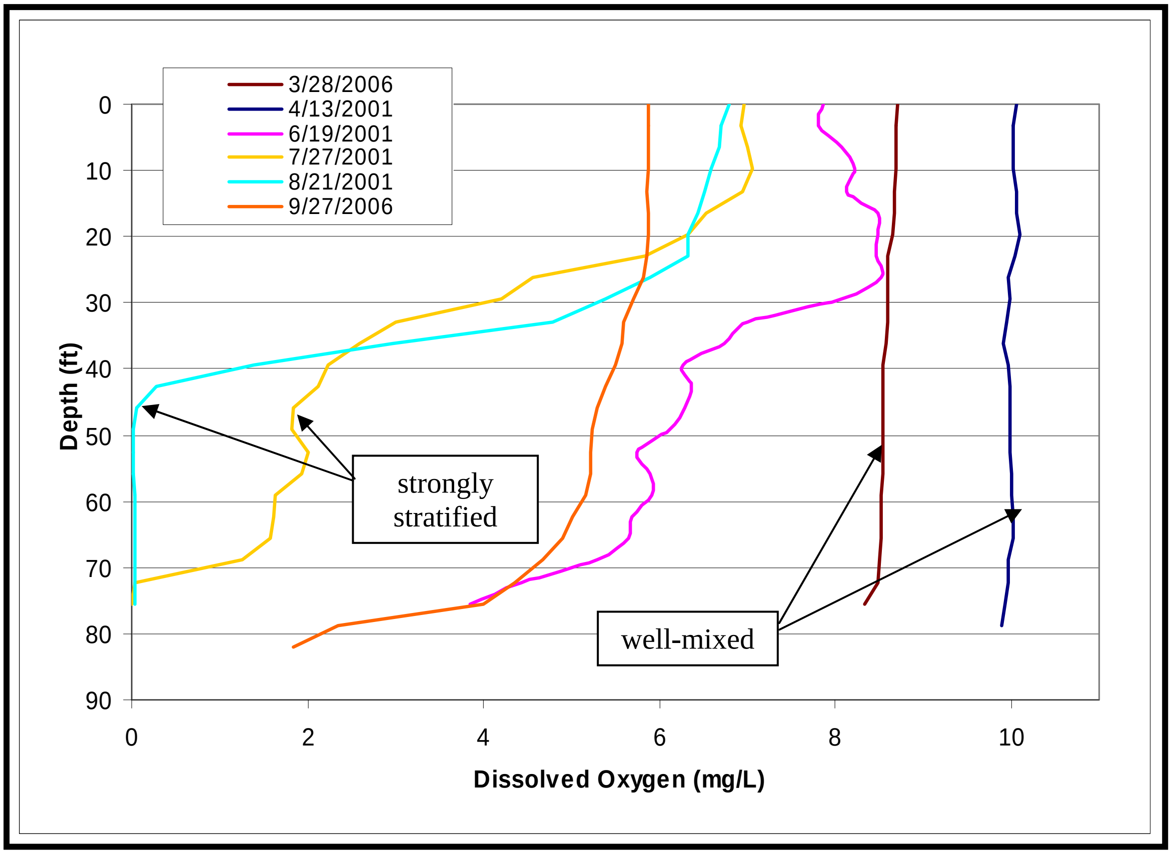
The Canadian River within the Project Area is "fully supporting" of its designated uses (listed above), while the Ute Reservoir is "fully supporting" for all uses except warmwater aquatic life. Ute Reservoir is considered impaired because of dissolved aluminum in the water and mercury in fish tissues. Potential sources of aluminum and mercury impairment are atmospheric deposition, impervious surface runoff, and unknown and natural sources. Although mercury is not normally detected in waters at elevated concentrations, it sinks and accumulates in sediments and from there enters the food chain. Mercury is not processed and excreted and, therefore, is accumulated in the tissues of aquatic species including fish. Mercury impairment is a national issue, and is not specific to the Ute Reservoir or Canadian River watershed.

Ute Reservoir

Water quality in reservoirs is affected by their inflow water quality, shape, length of shoreline, depth, and other characteristics. Ute Reservoir is about 15 miles long, about 0.5 mile wide, and has a large arm up Ute Creek. Ute Reservoir has a surface area of about 11 square miles and an average depth of about 30 feet. These factors affect whether a reservoir will be stratified (i.e., divided into horizontal layers of different temperature), which can also affect water quality. Temperature and dissolved oxygen levels vary within a stratified water body.

Ute Reservoir is normally stratified during the summer and well mixed during spring and fall. The reservoir also may stratify during the winter (actually a reverse stratification, with colder water in the top layers and warmer water in the bottom); however, no temperature information is available to confirm reverse stratification. Stratification during summer can result in extremely low oxygen levels at the bottom of the reservoir, which is also called an “anoxic” condition. Anoxic conditions are caused by decomposition of excessive organic matter which collects at the bottom of the lake, and can cause nutrients (e.g., phosphorus) and minerals (e.g., manganese) to be released from lake bottom sediments. Figure 17 shows very low dissolved oxygen levels in the deeper portion of the reservoir that occur in July and August when the reservoir is stratified, and higher oxygen levels occur in March and April when the reservoir is well mixed.

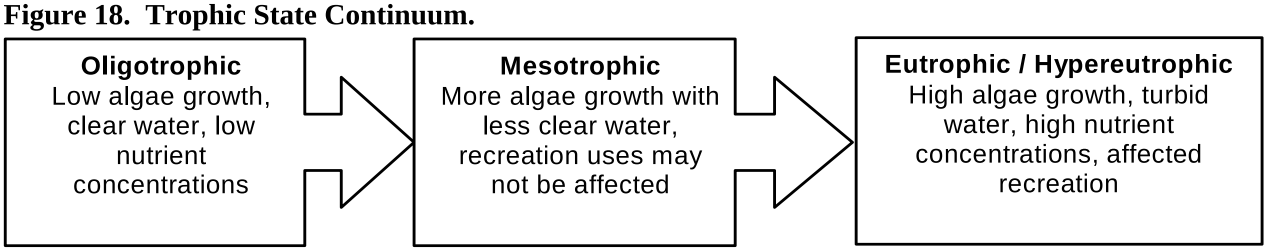
Figure 17. Ute Reservoir – Dissolved Oxygen and Depth Plot.



Source: Modified from scatterplot, MWH 2008.

Trophic state is a way of categorizing the biological activity in waters (Figure 18). Eutrophic reservoirs are characterized by high algae levels, water clouded by abundant microorganisms, and high nutrients. Oligotrophic conditions include low algae levels, clear water, and low nutrient concentration. Mesotrophic conditions fall in the middle with moderate algae levels, moderate cloudiness, and moderate nutrient levels. Ute Reservoir is mesotrophic based on the trophic state indicator, with moderately clear water and moderate levels of algal growth.

Figure 18. Trophic State Continuum.



Source: Modified from Wetzel (2001) and Carlson (1979).

Theoretical residence time can also help predict trophic state and, in turn, can be predicted by reservoir stratification. Theoretical residence time is the time that individual drops of water spend within a lake or reservoir. Shorter residence times are generally associated with less eutrophication as water is "flushed" out of the water body more rapidly. The theoretical residence time for Ute Reservoir is calculated as the average storage divided by the average outflow, or about 38 months (MWH 2008).

3.1.3.2 Water Quality and Treatability

Ute Reservoir

Ute Reservoir water is very "hard," meaning it has a high mineral content (normally calcium and magnesium). TDS concentrations are slightly higher than secondary drinking water standards for taste and odor. Hardness and TDS standards are aesthetically based, not health based. Other measured water quality concentrations for sulfate, arsenic, selenium, ammonia, and Escherichia coli (E. coli) are below the designated use standards. Ute Reservoir water was also tested for manganese and turbidity. Low levels of iron were detected, and no manganese was detected. Turbidity can be easily treated using traditional water treatment methods. Bromide—possibly from weathering of geologic formations or geothermal sources—also was detected in Ute Reservoir water. Bromide, in conjunction with disinfectants commonly used in water treatment, can produce DOC, which can be harmful and difficult to remove.

Canadian River

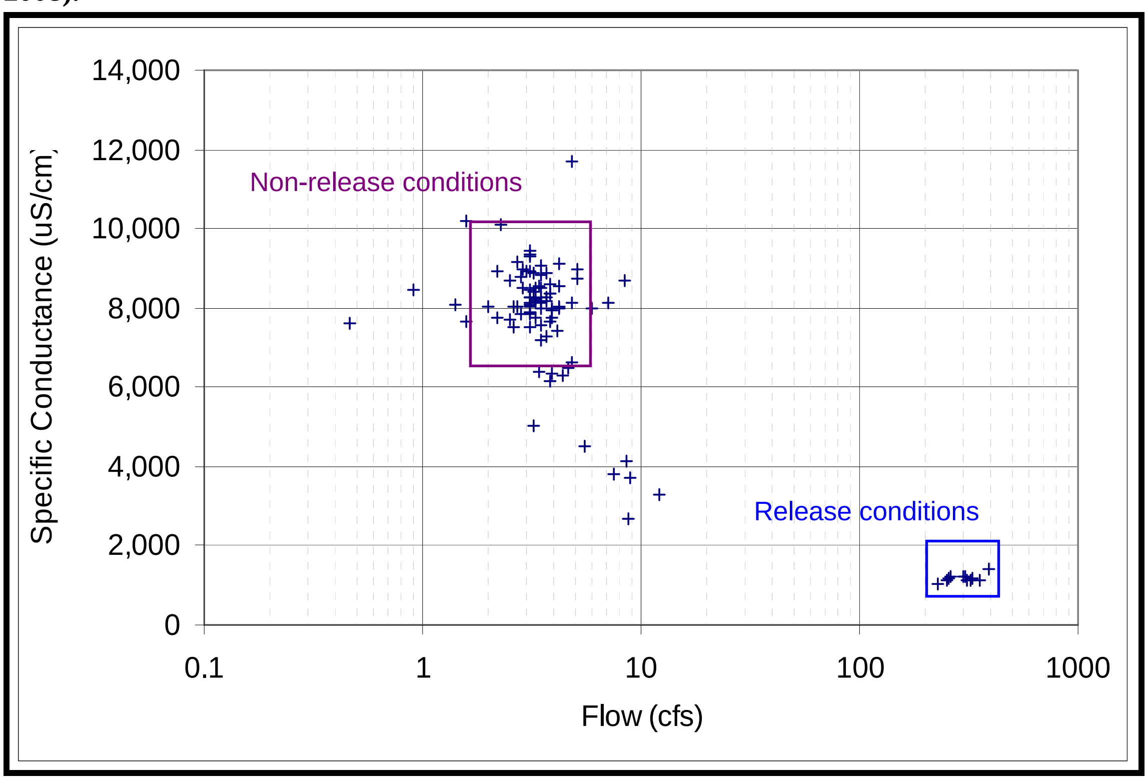
TDS is the main constituent of concern for the Canadian River. While the river directly downstream of Ute Reservoir has TDS comparable to that in the reservoir, concentrations increase downstream of the Revuelto Creek confluence. In this region, TDS is likely caused by a shallow brine aquifer in the lower Chinle Group that is under artesian pressure. The natural salts in underground formations dissolve in ground water and come to the surface in the Canadian River. The Lake Meredith Salinity Control Project is being conducted to improve the water quality by intercepting brine water that is seeping into the Canadian River through pumping of saline ground water from the Chinle Group and injection into deeper geologic formations (Lucas and Ulmer-Scholle 2001).

The CRMWA has conducted several water quality surveys of the Canadian River downstream of Ute Reservoir (Goodwin, pers. comm. 2009). When Ute Reservoir releases/spills are not occurring, salinity generally increases steadily for about 5 miles downstream of the dam, presumably due to inflow from the brine aquifer. The data suggest that when flows in Revuelto Creek are low, salinity concentrations stop increasing at about mile 6 and can begin to decrease between about mile 20 and the state line. When Revuelto Creek is in wet conditions (e.g., 21 cfs as described below), salinity normally decreases because of dilution. Flows and specific conductance in the Canadian River differ downstream of Revuelto Creek as described below:

- In typical dry conditions, flows are minimal in Revuelto Creek and specific conductance levels off until about mile 22, where flows increase slightly and specific conductance drops drastically.
- Under wet conditions, Revuelto Creek flows result in a dramatic dilution of specific conductance.

Figure 19 shows specific conductance in the Canadian River at Logan gage compared with streamflow. Grouping data with flows in the 3 to 5 cfs range shows that typical baseflow quality ranges between 6,000 and 10,000 µS/cm, with a median of 8,125 µS/cm (4,530 mg/L TDS), well above the level where several crops could be affected by salt content. Grouping date with flows greater than 200 cfs would be dominated by releases/spills from the reservoir because there is little drainage area between the reservoir and the Logan gage, and salinity has little variation with a median of 1,165 µS/cm (650 mg/L TDS), a level where effects on crops would be much less. Releases/spills from Ute Reservoir are approximately 325 cfs and result in a substantial change in Canadian River flow and water quality conditions from baseflow conditions.

Figure 19. Canadian River at Logan Gage – Specific Conductance and Streamflow (1992–2008).



Source: USGS 2009.

3.1.3.3 Ground Water

Ogallala Aquifer

As described previously, the Participating Communities rely on water from the Ogallala aquifer, and their water quality data were used to describe the ground water quality conditions in the Project Area. Minimal water treatment (i.e., chlorination) is generally needed for ground water supply wells. However, Ogallala aquifer ground water within the Project Area is generally high alkalinity, hard water, with elevated levels of TDS (also called salinity, a function of salt content in the water) and fluoride. Other water quality issues are described in Section 1.3.2.

Typical fluoride concentrations for Ogallala aquifer ground water are greater than the secondary drinking water standards described above, but do not exceed the health-based primary drinking water standards (Howard 1954; Landsford et al. 1982a, 1982b). More than 15 percent of samples collected from 1980 to 1998 in Curry and Roosevelt counties exceeded the secondary drinking water standard for fluoride (Litke 2001). Approximately 5 to 15 percent and more than 15 percent of ground water samples collected from Curry and Roosevelt counties, respectively, exceeded the secondary standard for iron (Litke 2001). More than 10 percent of ground water samples collected in Curry and Roosevelt counties had radon concentrations greater than the proposed primary drinking water standard, and more than 25 percent of samples collected in the southern portion of the Ogallala Formation exceeded the secondary maximum contaminant level (MCL) of 0.01 mg/L (Litke 2001).

The historical median TDS in the Ogallala Formation within the Project Area between 1980 and 1998 was 517 mg/L, and the 90th percentile was 1,620 mg/L (Litke 2001). These TDS levels are higher than the drinking water secondary MCL. The specific conductance median and 90th percentile between 1980 and 1998 were 906 and 3,000 µS/cm, respectively. These levels are in the range where irrigating moderately salt-tolerant crops with Ogallala aquifer water could be adversely affected (Maas and Grattan 1999). TDS levels in Ogallala aquifer ground water within the Project Area increase from the range of 250 to 500 mg/L in the northern portion of the Project Area to 501 to 1,000 mg/L in the southern portion of the Project Area near Portales. In addition, ground water salinity levels increase with depth bgs (Litke 2001), likely as a result of dissolution of minerals from underlying geologic formations.

Water quality data collected within the Project Area indicate that Ogallala aquifer water quality has decreased over the past 30 years. For example, TDS concentrations within the Project Area are higher in samples collected after 1980 than those collected prior to 1980. The overall range of TDS within the Project Area (i.e., 250 to 1,000 mg/L) has not changed, but the geographic distribution of higher TDS concentrations (i.e., 500 to 1,000 mg/L) has expanded from only in portions of Roosevelt County prior to 1980 to include all of Roosevelt County and the western portion of Curry County (Litke 2001). As water levels in the Ogallala aquifer decline with time, wells may be withdrawing higher TDS water located closer to bedrock.

Brackish Ground Water Aquifers

Ground water is contained in two brackish aquifers underlying the Ogallala aquifer (the Chinle Group and the San Andres Formation). Chinle Group water quality within the Project Area includes TDS concentrations near 5,000 mg/L, and estimates for the San Andres Formation are about 9,600 mg/L. Few water quality studies have been conducted for the San Andres Formation because of its poor water quality and high depth to water bgs. In addition to TDS, water samples from the Chinle Group collected east of the Project Area in Texas indicated radium-226 and radium-228 concentrations greater than the drinking water standard for combined radium-226 and radium-228 (MWH 2008).

3.1.4 Fluvial Geomorphology

Fluvial geomorphology is the study of landforms specifically related to rivers and streams. Rivers pick up and deposit sediments, changing the shape and location of the channel over time. When streamflow, sediment size and load, and channel slope are in balance, the channel is in equilibrium and experiences only small changes. When these factors are not in balance, the channel continues to change, seeking an equilibrium condition. Fluvial geomorphology is important because different channel conditions provide varying qualities of fish habitat (specifically the shiner) in the Canadian River downstream of the Ute Dam. The geomorphology of four minor draws in the Project Area—Revuelto, Frio, Running Water, and Blackwater—also is summarized.

3.1.4.1 Canadian River

The Canadian River from Ute Dam to the state line is a wide, shallow silt-and-sand bed stream. Ute Dam has reduced peak streamflows, and has likely affected the natural erosion and deposition process in this portion of the stream. The dam also captures sediment that naturally would flow downstream. Normally, large decreases in peak flows and lack of suspended sediment cause rivers to channelize. The Canadian River has channelized to some degree downstream of the Ute Dam. Channelization also allows riparian vegetation to spread closer to the channel because these areas are not scoured frequently by flood flows. About 7 miles downstream, Revuelto Creek enters the Canadian River and provides flood flows and sediment. As a result, the

Canadian River downstream of the Revuelto Creek confluence has more natural channel geomorphic processes.

The historic Canadian River channel meander pattern was studied using aerial photography from 1986 to 2006 and a field reconnaissance in 2007. The channel has not changed substantially over the 20-year period and appears to be stable. Additional information can be found in the *Hydrology Affected Environment Report* (MWH 2008).

3.1.4.2 Revuelto Creek

Revuelto Creek is a wide, shallow silt-and-sand bed stream similar in nature to the Canadian River. No flow-control structures (e.g., dams) are on Revuelto Creek, and as a result, flood flows has helped maintain natural channel geomorphic processes.

3.1.4.3 Minor Drainages

Two of the draws in the Project Area—Frio and Running Water—are active channels (i.e., defined channels that convey runoff at least once per year) with silty sand bottoms. The draws are relatively broad, shallow, and relatively stable. Blackwater Draw is a paleochannel, and does not have a well-defined channel, which is likely caused by less frequent flows than in Frio and Running Water draws. There are no apparent signs of geomorphic instability at any of the three drainages.

3.2 Recreation and Socioeconomics

The recreation and socioeconomics Project Area includes Quay, Curry, and Roosevelt counties. Although Ute Reservoir receives visitors from throughout New Mexico and nearby states, the Project Area focuses on the immediate region that receives the majority of economic benefits from visitors. Information about socioeconomic, and recreation conditions in this three-county area was gathered from a variety of sources, including federal, state, and local agencies; state and regional organizations; and the University of New Mexico. Local real estate experts and developers also were an important information source. The analysis for socioeconomics and recreation focused on the important issues and concerns that citizens and agencies brought up during the public scoping meetings in August 2007, and throughout the EA process. Additional information can be found in the *Socioeconomic and Recreation Resources Affected Environment and Effects Analysis Report* (BBC 2009).

3.2.1 Recreation

Recreation opportunities, as well as the economic benefits of recreation, vary throughout the Project Area. Recreation opportunities include both rural and urban opportunities, and include local parks, state parks and recreation areas, and private facilities such as golf courses and zoos. Private landowners in the Project Area also lease their properties for seasonal hunting, fishing, and off-road vehicle recreation opportunities. The primary recreation opportunities and economic benefits for counties and towns within the Project Area are described below.

3.2.1.1 Curry County

The City of Clovis is the main population center in Curry County and provides most of the county's recreation opportunities. Parks, the Hillcrest Park Zoo, Norman Petty Studios, and other urban recreation areas are in the city. Public fishing is allowed at several nearby locations (e.g., Ned Houk Park and Green Acres). Estimated travel expenditures for 2006 in Curry County were $79.5 million. It is estimated that Curry County employs about 830 full and part-time persons for travel-related expenditures.

3.2.1.2 Quay County

Tucumcari, Logan, and areas adjacent to these communities provide most of the recreational opportunities in Quay County. Tucumcari has various museums, landmarks, concerts, fairs, festivals, and activities related to the historic Route 66. Tucumcari is along I-40 and provides travel accommodations including hotels, food, fuel, and other travel necessities. Logan adjoins ULSP and shares its associated recreation and tourism opportunities. Ute Reservoir provides fishing, boating, swimming, camping, and wildlife viewing. Logan has stores that provide food, fuel, groceries, and other tourist necessities. The Ute Reservoir Marina has boat slips, boat rentals, supplies, five public boat ramps, and five public courtesy docks. Between 2004 and 2008, about 320,000 people visited ULSP each year. The Ute Reservoir visitors have an important economic value to Logan and Quay County. Table 7 presents some of the estimated annual effects of Ute Reservoir visitors on Quay County's economy based on average visitation to Ute Reservoir since 2004. Table 7 also shows average lake recreation visitor expenditures from national studies by the U.S. Army Corps of Engineers (Corps), and economic modeling of visitor expenditure effects on the Quay County economy using the IMPLAN input-output model.

Table 7. Estimated Annual Economic Effects of Ute Reservoir Visitors on Quay County.

	Direct Impact			Total Impact[1]		
	Output[2]	Jobs[3]	Labor Income	Output[2]	Jobs[3]	Labor Income
Retail trade	$2,585,810	66	$1,131,946	$2,865,060	71	$1,248,654
Accommodation/food service	$7,373,198	144	$2,136,549	$7,744,862	152	$2,240,900
Other service	$1,521,588	14	$292,344	$1,733,059	19	$374,607
Other sectors	$856,469	39	$199,835	$3,627,055	65	$974,894
Total	$12,347,065	263	$3,760,674	$15,970,036	306	$4,839,055

[1] Total impact includes induced (payroll spending) and indirect effects as well as direct impacts.
[2] Output represents gross receipts, except for retail trade, where it represents gross operating margins.
[3] Jobs includes full-time and part-time positions.

In the 2006 fiscal year, travel-related expenditures were approximately $36.1 million in Quay County. Tucumcari and Ute Reservoir visits accounted for most of these expenditures. It is estimated that Quay County employs about 310 full- and part-time persons for travel-related expenditures.

3.2.1.3 Roosevelt County

Portales is the main population center in Roosevelt County. Recreation opportunities include parks, playgrounds, archaeological sites, and museums at Blackwater Draw, Oasis State Park, and Grulla National Wildlife Refuge. Travel-induced economic impacts are lower in Roosevelt County than in other counties in the Project Area, an estimated $26.5 million in 2006. It is estimated that Roosevelt County employs about 230 full- and part-time persons for travel-related expenditures.

3.2.2 Socioeconomics

A majority of the Project Area counties and municipalities were incorporated prior to 1910 and grew because of railway and interstate highway service, and the availability of ground water for growing crops. Current population, types of industry and economic sectors, income, housing types and values, and other social and economic information are summarized below.

3.2.2.1 Population, Industry, and Income

Populations in the Project Area have grown slowly or decreased over the last 10 to 15 years. Population information for the counties and major municipalities is shown in Table 8.

Table 8. State, County, and Municipality Populations.

Area	2000	2006	Percent of Population 2006	Percent Change 2000–2006
New Mexico	1,819,046	1,954,599	-	7.5%
Curry County	45,044	45,513	100%	1.0%
City of Clovis	32,667	33,258	73.1%	1.8%
Village of Grady	98	96	0.2%	-2.0%
Village of Melrose	736	722	1.6%	-1.9%
City of Texico	1,065	1,050	2.3%	-1.4%
Balance of Curry County	10,478	10,387	22.8%	-0.9%
Quay County	10,155	9,155	100%	-9.8%
City of Logan	1,105	978	10.7%	-11.5%
City of Tucumcari	5,989	5,249	57.3%	-12.4%
Balance of Quay County	3,061	2,928	32.0%	-4.3%
Roosevelt County	18,018	18,291	100%	1.5%
Town of Elida	183	177	1.0%	-3.3%
City of Portales	11,153	11,308	61.8%	1.4%
Balance of Roosevelt County	6,682	6,806	37.2%	1.9%

Source: Census 2007.

Population projections are estimates of how populations will change over time. Several different estimates have been completed for the Project Area, and these predictions indicate an annual population increase ranging from 0.2 to 2.7 percent.

The economy of eastern New Mexico was established based on agriculture, and agriculture is still important. For Curry County, farming, ranching, dairies, CAFB, railroad, and retail trade are the primary economic contributors. Quay County economic contributors include agriculture, trucking and retail industries, recreation (at ULSP), and healthcare services. For Roosevelt County, dairies, peanut production, and Eastern New Mexico University (ENMU) in Portales, are important to the economy. For the three-county region, government also is an important employer. Table 9 provides information about employment and wages in Quay, Curry, and Roosevelt counties by industry sector.

Table 9. Quarterly Census of Employment and Wages – Fourth Quarter 2007.

Industry Sector	2007 Annual Average					
	Curry		Quay		Roosevelt	
	Employ-ment	Weekly Wages	Employ-ment	Weekly Wages	Employ-ment	Weekly Wages
Agriculture, forestry, fishing and hunting	1,493	$480	31	$406	1,008	$481
Crop production	58	$496	N/A	N/A	20	$400
Animal production	1,356	$471	N/A	N/A	973	$484
Mining	N/A	N/A	0	$0	10	$708
Utilities	79	$1,081	24	$1,104	53	$747
Manufacturing	593	$693	23	$412	433	$604
Wholesale trade	540	$424	3	$543	80	$490
Retail trade	2,349	$425	437	$376	691	$379
Transportation and warehousing	335	$622	138	$539	371	$610
Information	184	$507	18	$328	67	$552
Real estate, rental and, leasing	150	$443	15	$417	60	$446
Professional and technical services	313	$593	45	$528	47	$465
Management of companies and enterprises	N/A	N/A	N/A	N/A	0	$0
Administrative and waste services	495	$406	10	$649	89	$680
Educational services	11	$1,329	0	$0	5	$159
Healthcare and social assistance	2,666	$574	323	$563	443	$499
Arts, entertainment, and recreation	73	$155	N/A	N/A	28	$263
Accommodation and food services	1,671	$218	435	$197	1,134	$169
Other services, except public administration	445	$374	84	$387	105	$347
Unclassified	N/A	N/A	N/A	N/A	N/A	N/A
Total private	13,378	$494	1,876	$411	5,037	$425
Government	3,337	$681	900	$612	1,860	$703
Total all sectors	16,716	$532	2,776	$476	6,897	$500

Note: N/A: Nondisclosure.

Source: NMDWS 2008.

3.2.2.2 Current Water Rates and Trends in Water Costs for Participants

M&I water costs were analyzed as part of this EA. Annual water use per connection is highest in the largest communities – Clovis, Portales, and Tucumcari – which also have the largest commercial sectors. Average annual water costs per connection are most expensive in Clovis ($746) and least expensive in Melrose ($259).

All Participating Communities currently rely on ground water from the Ogallala aquifer for their M&I water supply. Overall, demand is much greater than aquifer recharge, as shown by declining water levels throughout the aquifer. As the water levels in the aquifer decline, less water can be pumped out. Well production rates also decline and wells eventually become too expensive to operate given the amount of water they are able to produce. The continual cost of reworking or drilling replacement wells is passed on to the residents and other users of M&I water supplies. The ability of the Participating Communities to provide a reliable M&I water supply is currently or will soon be limited by declining ground water levels in the Project Area. In addition, some Participating Communities face declining water quality that cannot be remedied without additional water treatment infrastructure.

3.2.2.3 Housing and Property Values

The number of housing units has grown faster than the population in most parts of the Project Area. In Quay County, and Logan in particular, the number of housing units for seasonal, recreational, or occasional use is high. This is due to seasonally occupied homes near Ute Reservoir.

Home values vary throughout the Project Area and also differ based on the types of housing. The average home value information presented below was collected from local real estate listings and sale information, with input from individual realtors. In Quay County, there is a large percentage of mobile homes—particularly in the Logan area—that are valued at about $50,000 to the high $100,000s. In general, the price of the mobile homes increases closer to the reservoir. In 2008, single-family homes located in Logan were typically valued from about $80,000 to $100,000. Lakefront properties may be valued from the mid-100,000s well into the millions.

The largest housing development planned in the area near Ute Reservoir is 12 Shores at Ute Lake, located along the southern shore of the western portion of Ute Reservoir. The first phase of the development will include 800 patio homes and 100 custom estate home sites. As of June 2009, there were approximately 180 patio home lots and 110 custom homes lots available for development. Of these lots, 12 patio homes and 4 custom homes had been constructed, and the golf course was 50 percent complete. The patios homes, ranging from 1,800 to 3,200 square feet, were being offered from $435,000 up to $600,000 as of August 2008. The custom home lakefront lots have generally been sold for approximately $70,000 per acre, while lots not on the lakefront have sold for approximately $40,000 per acre.

Another development near Ute Reservoir is Dos Rios. This development consists of 92 zoned residential lots; 32 of the lots are waterfront properties. In 2008, waterfront lots in the Dos Rios development were being listed from $175,000 up to $450,000. Lots not adjacent to the reservoir have been listed for $75,000 to $150,000.

Studies in other areas have also found that property values are highest for homes closest to the lakefront. Lakefront and lakeview properties are normally more desirable, and because of this higher demand have higher property values. This can be described as a "locational premium." Based on existing studies in other areas, as well as the information for the Logan area described above, lake frontage was estimated to add about 100 percent to the value of a property, compared to similar properties that do not have a lakefront or lakeview. A view of a lake generally adds about 50 percent to the value of properties that do not have lake frontage.

Tucumcari home values are less variable, and average from about $70,000 to $110,000, depending on lot size and location.

Clovis home values drive the average value in Curry County, and averaged about $140,000 in 2008. In 2008, home sale prices ranged from $17,000 to $1.6 million. In Roosevelt County, Portales home values averaged about $130,000, with a range between $10,000 and $595,000.

3.3 Threatened and Endangered Species

Federally threatened and endangered species are protected under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). The ESA defines an endangered species as "a species in danger of becoming extinct throughout all or a large portion of its range" and a threatened species as "a species likely to become endangered in the foreseeable future" (50 CFR 17.3). Section 4 of the ESA prohibits the "take" of any federally listed species. Take is defined as "to harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect wildlife." Candidate species are plants and animals for which there is sufficient information on their biological vulnerability to support federal listing as endangered or threatened (63 Fed. Reg. 13347), but listing is precluded by other higher priority listing activities. No regulations require consultation for effects to candidate species; however, if a candidate species becomes listed during Project planning or construction, consultation with the Service would be required.

Table 10 lists federally listed threatened, endangered, and candidate species that the Service has identified as potentially occurring in Quay, Curry, and Roosevelt counties (Service 2008). Of these species, three may occur in the Project Area, and are described in more detail. Potential effects to a federally listed species or its habitat resulting from a project with a federal action require consultation with the Service under Section 7 of the ESA. A biological assessment (BA) also is being prepared for the federally listed species, and consultation with the Service is complete.

Table 10. Federally Listed Threatened, Endangered, and Candidate Terrestrial Species in Quay, Curry, and Roosevelt Counties Potentially Occurring in the Project Area.

Common Name	Scientific Name	Status*	Habitat	Potential to Occur in Project Area
Mammals				
Black-footed ferret	*Mustela nigripes*	FE	Large prairie dog colonies	Not likely to occur
Fish				
Arkansas River shiner	*Notropis girardi*	FT	Wide, sandy bottomed streams and rivers	Known to occur downstream of Ute Dam
Birds				
Interior least tern	*Sterna antillarum athalassos*	FE, SE	Sandy/pebble beaches on lakes, reservoirs, and rivers	Transient occurrence
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	FC, SOC	Sand sage steppe; sandhills with shrub component	Known to occur in/near Project Area
Reptiles				
Sand dune lizard	*Sceloporus arenicolus*	FC, SE	Sand hills with shinnery oak component	Not likely to occur

*FE –Federally Endangered; FC – Federal Candidate for listing as Threatened or Endangered; SE – State endangered; SOC – State Species of Concern.

3.3.1 Interior Least Tern

The interior least tern (*Sterna antillarum athalassos*) is a migratory colonial bird that nests on North American tidal and riverine beaches and islands, as well as on sandbars and reservoir shorelines, creating a shallow "scrape" in sandy, unvegetated areas in which they lay their eggs. For the past 40 to 50 years, there only has been one known population of terns in New Mexico, which were found near the Bitter Lake National Wildlife Refuge. There is also a documented occurrence in the City of Roswell from the 1980s (NMDGF 2008a). Nesting individuals have been reported on the shores of Brantley Reservoir intermittently from 2003 through 2008. Due to the lack of available nesting habitat (i.e., sandy areas with 0 to 15 percent vegetation above high water levels, in areas with little human disturbance), the tern is not known to nest and is not likely to nest in the Project Area (Thompson et al. 1997; NMDGF 2008a).

3.3.2 Lesser Prairie-Chicken

The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is a resident grouse that occurs in five states of the Great Plains: Kansas, Oklahoma, Texas, New Mexico, and Colorado (Hagan and Giesen 2005). This species has declined dramatically since the 1800s, mainly due to large-scale conversion of native prairie to agricultural lands, overgrazing, and drought. The prairie-chicken is now restricted to small, isolated populations across its historical range. Past reintroduction and transplant efforts have been unsuccessful (Hagan and Giesen 2005). Due to its decline and threats, the prairie-chicken is a candidate species for federal listing (66 FR 54817 (October 30, 2001)) and is listed by the State as a species of concern (NMDGF 2006).

Prairie-chickens are typically found in rangelands dominated by shinnery oak-bluestem or sand sagebrush-bluestem communities (Massy 2001). They have used cropland that has been restored to grassland under the Conservation Reserve Program, particularly when mixed with forbs (Hagan and Giesen 2005). The prairie-chicken is typically found in midgrass prairie rangelands and shrublands associated with sandy soils. As with many grouse, prairie-chickens form leks where females select mates, typically between late March and May (Hagan and Giesen 2005). Lek sites have little vegetation and are often on knolls or ridges. Man-made disturbed areas such as roads and oil pads may be used for leks. Nests are usually within 2 miles of leks, on the ground, and in areas where shinnery oak or sand sagebrush grasslands have dense canopies and there is a diversity of low vegetation. Nesting season is between mid-April and early July, and juveniles are independent by fall dispersal. In the winter, prairie-chickens are often found in areas with more cover, including riparian areas and small-grain agricultural fields.

Numerous leks occur near the Project Area, although no leks are located within the Project Area. The majority of the leks are located between the Caprock and the city of Clovis. The nearest known leks are located about 0.25 to 0.5 mile from the Project Area (NMDGF 2008b).

3.3.3 Arkansas River Shiner

The shiner (*Notropis girardi*) is a small fish that lives in the main channel habitat of wide, shallow, turbid, sandy bottomed streams in the Arkansas River basin (Gilbert 1980; Service 2005). In the Project Area, the Canadian River downstream of Ute Dam and Revuelto Creek provide habitat for this federally threatened species. Shiners prefer habitat with sand as the primary substrate. The shiner also inhabits areas in which silt is the primary substrate, especially during fall and spring (Bonner 2000). The shiner was listed as federally threatened in 1998 (50 CFR Part 17, Federal Register, November 23, 1998).

In the Project Area, the shiner occurs in the Canadian River downstream from Ute Reservoir to the state line. The Canadian River between Ute Reservoir in New Mexico and the state line has historically supported a largely intact plains river fish community and contains one of the largest populations of shiners that is reproducing in a natural setting (Service 2005). The Management Plan was implemented in 2005 (see Section 1.2.5 on page 5) as a measure to protect the shiner and preclude the designation of critical habitat in the Canadian River between Logan and Lake Meredith in Texas. Some of the protection measures include maintenance of base flow in the river, control of invasive shrubs and trees (tamarisk and Russian olive), and control of motorized vehicles in the river in fish habitat. Population monitoring by the State shows that shiner populations downstream of Ute Dam are stable (GEI 2009).

3.4 Wetlands and Vegetation

3.4.1 Wetlands

Wetlands were delineated within the Project Area (comprising a 300-foot-wide buffer on either side of the proposed pipeline alignment), and include saltcedar wetlands, hackberry wetlands, emergent (cattail and other herbaceous vegetation) wetlands along the Ute Reservoir shoreline, and two playa areas. Wetlands were documented along drainages, including the named drainages of Revuelto Creek—San Jon Creek, Frio Draw, and Running Water Draw. The Canadian River and Revuelto Creek are perennial drainages that have a permanent flow throughout the year. San Jon Creek, Frio Draw, Running Water Draw, and unnamed larger tributaries are intermittent drainages that contain flows during wet months or after storm events. Several dry ephemeral tributaries that do not support wetlands, but may be considered waters of the U.S., occur within the Project Area.

3.4.2 Vegetation

The Project Area is generally characterized by rolling sand plains, shinnery oak sand prairie, and shrub steppe. Short, mid, and tallgrass prairie are all present in different parts of the Project Area. Agricultural uses, including livestock grazing and crop production, occur throughout the region. Seasonal playas, drainages, and stock ponds support some wetland and riparian plant species.

Vegetation communities and land cover activities, including agriculture (disturbed and fallow) and urban categories, were mapped for the Project Area. In addition, potential habitat for plant species of concern was identified during vegetation mapping efforts.

Vegetation Communities

Vegetation communities and total acreage within the Project Area are shown in Table 11. Acreages were calculated based on a 300-foot-wide buffer on either side of the proposed pipeline alignment.

Table 11. Vegetative Communities Observed in the Project Area.

Vegetative Community	Description	Total Acreage*
Agriculture	Variety of dryland and irrigated row crops	1,640
Closed conifer woodlands	Caprock area; juniper, pine, oak, and other species	15
Disturbed and fallow	Roadsides, railroads, power lines, and overgrazed areas	1,627
Mesic mixed grasslands	Moist grassland community along drainages and playas	10
Midgrass prairie	Grasses: threeawn, sideoats grama, blue grama, little bluestem, sand dropseed, scattered broom snakeweed, yucca, and tree cholla	1,750
Mesquite midgrass prairie	Honey mesquite with grass understory, including big bluestem, silver beardgrass, little bluestem, sand dropseed, and needle and thread	107
Mesquite shortgrass prairie	Honey mesquite and tree cholla with understory species silver beardgrass, blue grama, and plains prickly pear; mostly south of Clovis	1,191
Mixed shrub steppe	Sand sage, honey mesquite, and skunkbush sumac, mostly north of the Caprock	817
Open juniper woodlands	Open canopy of Utah juniper and one-seed juniper, along the Caprock	59
Playa	Seasonally wet, flat, or depressional areas where water ponds; scattered throughout the Project Area	7
Shortgrass prairie	Sideoats grama, blue grama, and sand dropseed with scattered yucca; common community in the Project Area	2,033
Rock outcrops	Areas along the Caprock and above Revuelto Creek, rocky cliffs with little or no vegetation	1
Riparian woodland	Riparian woodlands along sandy washes, in valleys, and in wetland areas; saltcedar is dominant	3

Vegetative Community	Description	Total Acreage*
Urban	Buildings, subdivisions, commercial and industrial parks, cities, towns, and similar developments	410
Streamside wetland	Limited in the Project Area; along drainages or playas; cattail, rushes, and saltcedar are dominant	2.5
Ute Reservoir shoreline wetland	Scattered along Ute Reservoir shoreline and islands; cattail and saltcedar are dominant	123

*Acreages calculated from 300-foot-wide buffers on either side of the proposed pipeline alignment.

Plant Species of Concern

Four plant species of concern potentially occur in the Project Area (Table 12). Although none of these species were found during field surveys, there is suitable habitat in the Project Area.

Table 12. Plant Species of Concern with Potential to Occur in the Project Area.

Common Name ***Scientific Name***	State Status/ Rank	GRank	Habitat	County
Dwarf milkweed *Asclepias uncialis ssp. uncialis*	D/S2	G3G4T2 T3	Sand loam soils, disturbed sites, juniper woodland and desert scrub; 5,000 – 5,500 ft above sea level (asl)	Quay
Panhandle spurge *Euphorbia strictior*	D/S3	G3	Shortgrass prairies, dry, rocky, or deep sandy sites; disturbed areas and plains and hills; 3,000 – 5,000 ft asl	Quay
Sandhill goosefoot *Chenopodium cycloides*	D/S2	G3G4	Sand dunes, blowouts, and sandy areas; 2,500 – 5,000 ft asl	Quay and Roosevelt
Dune unicorn-plant *Proboscidea sabulosa*	S/S3	G3	Deep sandy soil, seasonally moist, sparsely vegetated and unstabilized dunes in oak bluffs, fallow fields; early successional species; 3,000 – 4,600 ft asl	Roosevelt

State Status/Rank: D = dropped from state list; S = state sensitive; S1 = Critically imperiled in state because of extreme rarity; S2 = Imperiled in state because of rarity; S3 = Vulnerable in state; S4 = Apparently secure in the state.

Global Ranks: G1 = Critically imperiled globally because of extreme rarity; G2 = Imperiled globally because of rarity; G3 = Vulnerable throughout its range or found locally in a restricted range; G4 = Apparently secure globally; G5 = Globally secure.

Noxious Weeds

Noxious weeds are located mostly along roadsides, ditches, or riparian areas. Common roadside weeds include Siberian elm, Russian knapweed, and field bindweed. Saltcedar and Russian olive occur along the Canadian River and other drainages, including Ute Creek, and along portions of the Ute Reservoir shoreline. Most of the weeds occur as minor components of the vegetation communities. Saltcedar control along the Canadian River and Revuelto Creek is completed by the CRMWA as part of the Arkansas River Shiner Management Plan (CRMWA 2005).

3.5 Wildlife Resources

As listed in Table 11, the variety of vegetation communities in the Project Area provide habitat for a range of wildlife, including game species and various mammals, reptiles, amphibians, and birds. Most areas of habitat within the Project Area have been disturbed, including construction of roads and communities, agriculture and grazing, and installation of infrastructure such as powerlines and pipelines.

Large game wildlife species such as elk, deer, and pronghorn are considered economically important species in the State. Ute Reservoir also provides a managed stocked game fishery, with species such as white bass, walleye, and largemouth and smallmouth bass. The white bass population in Ute Reservoir is self-sustaining (Frey, pers. comm. 2009). This species is a shoreline spawner during mid-April to mid-May, at depths of about 2 to 7 feet on generally rocky or gravel substrate (Becker 1983). Walleye and largemouth and smallmouth bass do not spawn at population-sustaining levels in Ute Reservoir, and are stocked on an annual or semi-annual basis (Frey, pers. comm 2009). Other unmanaged species that provide fishing opportunities include common carp, yellow bullhead, northern pike, and bluegill. The common carp is considered a nuisance species.

One freshwater mussel, the paper pondshell was listed as state endangered (NMDGF Reg. 624) in 1983. In the study area, only one fresh valve of an immature paper pondshell has been found from Ute Creek near Ute Reservoir (NMDGF 2008a). Historic populations in the Conchas River near Variadero are apparently extirpated and may be the source for the Conchas Lake population (NMDGF 2008c). The paper pondshell is one of the most widely distributed freshwater mussels in North America (NMDGF 2008c), occurring over a wide variety of substrates (mud to gravel) in a wide variety of habitat types (reservoirs, lakes, rivers, and streams). This mussel has been introduced to impounded waters throughout the United States by fish stocking and bait bucket introductions and this is likely the source of the specimens at in the study area (NMDGF 2008d). Taxonomic studies and introductions via both legal and illegal fish stocking have raised questions regarding specific identity and native status of the paper pondshell in New Mexico (NMDGF 2008c).

Two other state listed species are found within the project area in the mainstem of the Canadian River. The Arkansas River speckled chub (*Macrhybopsis tetranema*) is native to the Arkansas

River drainage of southeastern Colorado, northeastern New Mexico, southwestern Kansas, the Texas Panhandle, northern Oklahoma, and western-most Arkansas (Probst 1999). In New Mexico, Arkansas River speckled chub historically was limited to the South Canadian River from near the confluence of Ute Creek downstream. In the study area, Arkansas River speckled chub persists in the South Canadian River downstream of Ute Dam and the lower reaches of Revuelto Creek where it is uncommon to common, depending upon the availability of its preferred habitat of moderate velocity, shallow, sand and gravel-bottomed runs (Probst 1999). It is believed that the reproductive biology of Arkansas River speckled chub is a pelagic broadcast spawner producing non-adhesive, semi-buoyant eggs. Fertilized eggs drift with the current and develop rapidly (Probst 1999). In New Mexico, it is most commonly associated with other small fishes characteristic of western Great Plains streams and common in the Canadian River downstream of Ute Dam (Probst 1999).

The suckermouth minnow is a state-listed species which occurs throughout much of the central and lower Mississippi River system, including the Missouri and Ohio River drainages and rivers tributary to the Gulf of Mexico in Texas (Probst 1999). In New Mexico, the native range of suckermouth minnow includes only the South Canadian and Dry Cimarron rivers. The species there has a discontinuous distribution and is generally rare (Probst 1999). Suckermouth minnow most commonly occupy shallow up to moderately deep (0.1 to 1.0 m), sand and gravel-bottomed riffles of low to moderate gradient, meandering streams (Probst 1999). The reproductive season is from April through August and reproduction occurs in sand-gravel riffles. Collection records for New Mexico are limited, but the minnow occurs rarely in the Canadian River and the lower Dry Cimarron (Probst 1999).

Raptors such as the red-tailed hawk, Swainson’s hawk, ferruginous hawk, and American kestrel likely forage among grassland and agricultural areas throughout the Project Area where prey species such as the black-tailed jackrabbit, cottontail rabbit, and prairie dog are abundant. The northern harrier may occur in these habitats and near wetlands. In the 1950s, golden eagles were recorded as nesting on the Caprock, which offers rocky outcrops similar to many foothill regions in central and western New Mexico (Ligon 1961). Habitat in the Project Area likely supports a wide variety of songbirds, including swallows, larks, doves, kingbirds, orioles, sparrows, towhees, and finches. Wetlands and both permanent and seasonal open water provide potential breeding and foraging habitat for species such as the red-winged blackbird and long-billed curlew. Several migrating species such as yellow-headed blackbird, sandhill crane, and spotted sandpiper may move through these areas resting on their way to nesting grounds farther north.

The largest concentration of wetlands is associated with the Canadian River, Ute Reservoir, and Revuelto Creek.

The largest areas of suitable habitat for amphibians are wetlands. Playas and stock ponds or tanks provide suitable breeding habitat for amphibians such as tiger salamanders and plains leopard frogs. Some amphibian species, including plains spadefoot, New Mexico spadefoot, Great Plains toad, and Woodhouse's toad, live in drier areas in shortgrass and midgrass prairie and shrublands. A variety of reptiles also are likely to occur in the Project Area, including snakes, turtles, lizards, and skinks.

Most of the Project Area provides potential habitat for carnivores such as the coyote, red fox, and badger. Small mammals are likely abundant within the Project Area, including various rabbits, small rodents, and bats, with species such as raccoon, beaver, and muskrat occurring near wetter areas.

Species determined to be threatened or endangered within the State are protected under the New Mexico Wildlife Conservation Act (NM ST §§ 17-2-37 – 46). Under this Act, it is unlawful to kill any state protected species. The New Mexico State Game Commission issues regulations and develops management programs for New Mexico species, which are then implemented by the NMDGF.

The Natural Heritage New Mexico Program (NHNMP) maintains a list and ranking of rare and imperiled wildlife and plant species in New Mexico. NHNMP-monitored species generally include federal- and state-listed endangered species, as well as other species of concern. NHNMP-listed species have no formal regulatory status or protection.

Table 13 includes species that the State has listed as threatened or endangered, or species of special concern potentially occurring in Quay, Curry, and Roosevelt counties (NMDGF 2009). Species tracked by the NHNMP that are considered rare or imperiled (S1 and S2 rankings) in the State were also listed (NHNMP 2008). Species with potentially suitable habitat in the Project Area are listed in Table 13.

Table 13. State Endangered and Threatened Species, and Species of Special Concern Potentially Occurring in the Project Area.

Common Name	Scientific Name	Status*	Suitable Habitat in the Project Area
Mammals			
Black-tailed prairie dog	*Cynomys ludovicianus*	SOC, S2	Eight colonies throughout the Project Area; most 5 to 55 acres, one 233 acres
Common hog-nosed skunk	*Conepatus leuconotus mearnsi*	SOC	Caprock and mesquite-dominated shrublands north of the Caprock

Common Name	Scientific Name	Status*	Suitable Habitat in the Project Area
Least shrew	*Cryptotis parva*	ST, S2	Known to occur near Tucumcari in Quay County and near the La Grulla National Wildlife Refuge in northeastern Roosevelt County; could occur near drainages in the Project Area
Ringtail	*Bassariscus astutus*	SOC	Most likely to occur near the Caprock, as well as shrublands containing mesquite and sage; may occur throughout the Project Area
Swift fox	*Vulpes velox*	SOC, S2	Shortgrass and midgrass prairie and shrublands throughout the Project Area
Western spotted skunk	*Spilogale gracilis*	SOC	Most likely to occur along the Caprock
Birds			
Baird's sparrow	*Ammodramus bairdii*	ST, S1	Ungrazed or lightly grazed mixed-grass prairie and meadows throughout the Project Area
Bald eagle	*Haliaeetus leucocephalus*	ST, S1B, S4N	No known breeding areas; may roost or feed in trees near rivers, lakes, and prairie dog towns
Gray vireo	*Vireo vicinior*	ST	Along the Caprock in closed conifer woodlands
Loggerhead shrike	*Lanius ludovicianus*	SOC	Throughout the Project Area in agricultural areas with nest trees; may be present near abandoned ranch houses
Mississippi kite	*Ictinia mississippiensis*	SOC	Most likely to occur in large trees near Canadian River, Revuelto Creek, wooded urban areas, and farmhouses; documented within the Project Area
Mountain plover	*Charadrius montanus*	SOC	May occur in shortgrass or disturbed prairie in the Project Area
Peregrine falcon	*Falco peregrinus anatum*	ST, S2B, S3N	May nest in rocky areas and conifer woodlands along the Caprock, or in rocky outcrops near Ute Reservoir
Western burrowing owl	*Athene cunicularia hypugaea*	SOC	May be present in shortgrass prairie with prairie dog colonies or other burrowing species
White-faced ibis	*Plegadis chihi*	SOC	Known to breed in Quay County; potential habitat in larger playas, near Ute Reservoir, and marshy areas in the Project Area
Yellow-billed cuckoo	*Coccyzus americanus occidentalis*	SOC	Riparian woodlands along drainages in the Project Area
Arkansas River speckled chub	*Macrhybopsis tetranema*	ST	Known to occur downstream of Ute Dam Low gradient, main channel streams with fine gravel or sand substrate

Common Name	Scientific Name	Status*	Suitable Habitat in the Project Area
Suckermouth minnow	*Phenacobius mirabilis*	ST	Known to occur downstream of Ute Reservoir. Mainly sand, gravel, and rubble-bottomed riffles in small to moderate-sized streams
Paper Pondshell	*Utterbackia imbecillis*	SE	Documented in Ute Reservoir. Mud, sand, and gravel substrates of lakes and rivers

*SE = State Endangered; ST = State Threatened; SOC = Species of Special Concern; S1 = Critically imperiled in the state because of extreme rarity; S2 = Imperiled in the state because of rarity; S3 = Vulnerable in the state; S4 = Apparently secure in the state; SB = Refers to breeding population; SN = Refers to nonbreeding population.

Source: NHNMP 2008; NMDGF 2009.

3.6 Geology, Climate, Soils, and Air Quality

3.6.1 Geology

The Project Area covers two general geologic areas – exposed upper red-bed sediments that form the badlands north of the Llano Estacado escarpment (southwest of San Jon along the Project Area) and those on top of the Caprock, south of the Llano Estacado escarpment, generally forming the flatlands and playas in the southern portion of the Project Area.

The northern portion of the Project Area is dominated by the Upper Triassic Chinle Group, consisting of reddish sedimentary rocks, mostly sandstones and conglomerates, that extend from west Texas into eastern New Mexico. The Project Area crosses the Chinle Group members – Bull Canyon, a soft mudstone-rich formation that forms badlands and slopes capped by the sandstones of the Redonda Formation. The Bull Canyon Formation generally overlies the sandstone and conglomerate-dominated Trujillo Formation (Morgan et al. 2001).

South of I-40, the Project Area crosses the Caprock. The lower, northern portions of the escarpment contain Lower Cretaceous Tucumcari Formation shales and mudstones with thin sand and shell conglomerates (Lucas and Ulmer-Scholle 2001). The upper portions of the escarpment contain orange-brown sandstones of the Upper Triassic to Cretaceous Redonda and Mesa Rica Formations, capped by the eolian sandstones of the Ogallala Formation that forms the Caprock. The Ogallala Formation consists of eolian sand and silt, and fluvial and lacustrine sand, silt, clay, and gravel (McLemore 2001), and ranges in thickness from 30 to 600 ft in eastern New Mexico and west Texas (Gustavson 1996).

South of the Llano Estacado escarpment, the Quaternary Blackwater Draw Formation generally overlies the Ogallala Formation. The Blackwater Draw Formation is composed mostly of eolian sand deposited during cyclical dry periods that resulted in large accumulations of sands, followed by more humid conditions resulting in cemented soils (McLemore 2001).

Geologic hazards include landslides, faults and seismicity, corrosive soils, expansive soils, and soil stability. Most of the Project Area is geologically stable. According to USGS mapping, the entire Project Area is categorized as a low area of landslide incidence with the areas adjacent to the Caprock having moderate susceptibility (Radbruch-Hall et al. 1982). The Project Area is also seismically stable, and lacks structural geologic elements (e.g., faults, folding and crustal deformation), with the possible exception of the Tucumcari structural zone west of the Project Area. The zone consists of gentle folds that trend northeast, bounded by the Bonita fault zone, generally along the Llano Estacado escarpment west of the Project Area near San Jon. The Bonita fault zone is thought to have generally been active during the Laramide orogeny (Hunt and Lucas 2001). Since 1869, no recorded earthquakes above a 4.5 magnitude have been recorded or identified by the New Mexico Bureau of Geology and Mineral Resources in the Project Area (Sanford et al. 2002, 2004). Project Area soils are generally stable, noncorrosive, and have low to moderate swelling potential (Olive et al. 1989).

3.6.2 Climate

The climate of the region can be described as semiarid. Precipitation averages less than 20 inches annually on the Llano Estacado escarpment, and decreases from north to south and from high to low elevations. Rainfall generally comes from summer thunderstorms originating from tropical moisture from the Gulf of Mexico and Pacific Ocean. Most of the precipitation from thunderstorms is lost to runoff and evaporation (Kovacik et al. 2000). The weather pattern during the warm season is characterized by rapidly shifting conditions, with frequent extreme changes in temperature, frequent thunderstorms, and tornadoes. Spring wind gusts exceed 35 miles per hour, and summer temperatures can reach 100 degrees Fahrenheit. The average growing season is approximately 190 days (Kovacik et al. 2000).

3.6.3 Soils and Farmland

Soils in the Project Area include mollisols, aridisols, entisols, and alfisols, which range from fertile soils to sandy, less-fertile soils (EPA undated). Three special soil categories—farmland classifications, hydric soils, and erodible or unstable soils—were reviewed and are summarized. Prime Farmland or Prime Farmland if Irrigated are soils and lands with the best combination of physical and chemical characteristics for growing food, fiber, or other consumable products. These labels also take into account the terrain and growing season. Areas that have all of the best characteristics, but need to be irrigated for optimal growth, are considered Prime Farmland if Irrigated. Farmland of Statewide Importance has been used at least two seasons to grow crops, but does not have the desirable characteristics of Prime Farmland or Prime Farmland if Irrigated. According to the Natural Resource Conservation Service (NRCS), “A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (NRCS 2009). Finally, the Project Area was reviewed for soils that are highly erodible or unstable, including those having high shrink and swell variances (U.S. Department of Agriculture (USDA) 1958, 1967, 1974).

Areas of Prime Farmland if Irrigated and Farmland of Statewide Importance are located primarily between Grady and Portales, and Melrose and Texico. No hydric soils are in the Project Area.

3.6.4 Air Quality

The Project Area is within the Canadian River and Southern High Plains airsheds, and is within an EPA air quality attainment area. There are no Class I airsheds within the Project Area. The nearest Class I airsheds are the Salt Creek Wilderness and the Pecos Wilderness, both of which are about 150 miles west of the Project Area (NMED 2009).

3.7 Cultural Resources

Cultural resources are locations of human activity, occupation, or use. Cultural resources can be archaeological sites, buildings, structures, and places, and can be related to past cultures (usually prehistoric), or people or events (usually historic).

Evaluation of cultural resources is required on all projects requiring federal approval, under Section 106 of the National Historic Preservation Act (NHPA, 1966, as amended). A Programmatic Agreement between Reclamation, ENMWUA, and SHPO has been executed. Cultural resources are also protected under other federal laws, including the Archaeological Resources Protection Act and the Native American Graves Protection and Repatriation Act. State law also requires protection of cultural resources. Cultural resource surveys, testing, and analysis at the Project Area complied with all federal and state laws. The Project Area was partially surveyed for cultural resources, but was restricted where landowners declined to provide access.

In summary, the Project Area was inhabited by hunter-gatherers of the Southern High Plains; is on the extreme northern periphery of the semisedentary Jornada Mogollon; is located along the eastern trading periphery of the Rio Grande Pueblos; and contains some of the best known Paleoindian sites on the continent, including Blackwater Draw Locality No. 1 (the Clovis type site). Each of these cultures potentially left cultural resources in the Project Area.

The cultural resources inventory resulted in the documentation of 35 cultural resources. The cultural resources include 12 prehistoric, 21 historic, and 2 multicomponent sites. Prehistoric sites are concentrated in the area of Ute Reservoir along the Caprock, and are associated with the major draws in the Project Area (i.e., Frio, Running Water, and Blackwater). Historic sites are dominated by abandoned farming/ranching habitation sites and trash dumps, and are found throughout the Project Area. There is a high possibility of finding additional intact cultural resource sites, as well as buried or undiscovered cultural resources during construction.

3.8 Indian Trust Assets

Indian Trust Assets (ITAs) are "legal interests" in assets held in trust by the U.S. Government for individual Indians or tribes. Lands, minerals, water rights, hunting and fishing rights, claims, titles, or money are some of the assets held in ITAs. As assets held in trust, ITAs cannot be sold, leased, or alienated without the express approval of the U.S. Government. Secretarial Order 3175 and Reclamation policy require that Reclamation evaluate and assess impacts of a proposed project on ITAs. This requires inventorying all ITAs within the Project Area. Should any ITA be impacted, mitigation of impact must be undertaken. During government-to-government consultation, no ITAs were identified in the Project Area (see Table 24).

3.9 Environmental Justice

Executive Order 12898, dated February 11, 1994, established the requirement to address environmental justice concerns in the context of federal actions. Federal agencies are required to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations.

The entire three-county Project Area has a lower median household income than the State and the nation. The proportion of the population living below the poverty level within the Project Area is slightly higher than in the State. Logan and Grady have the lowest proportions of residents living below poverty level, at 11.1 percent and 12.5 percent, respectively. Tucumcari and Portales have the highest proportion of residents living below poverty level, at 24.8 percent and 24.9 percent, respectively. These proportions are approximately 1.35 times higher than the State average; however, of these residents, the proportion in Portales may be influenced by students at ENMU.

Minority populations vary considerably across the Project Area, from 0 to 55.7 percent. The national average is 30.9 percent, State average is 55.3 percent, and the average for the Project Area is 40.3 percent. The primary minority population is Hispanic. Based on definitions set by

Executive Order 12898, Texico and Tucumcari are considered minority communities because minority populations exceed 50 percent; however, these community averages are very close to the State average.

Chapter 4. Effects Analysis

This section is an evaluation of the potential environmental effects of the No Action Alternative and Proposed Action. The *Hydrology* section, which includes surface water, ground water, water quality, and geomorphology, is the primary "driver" for other resource impacts. It may be necessary to refer to the *Hydrology* section for maps, tables, and clarification of concepts.

4.1 Hydrology

In the *Effects* section that follows, the terms "wet," "dry," and "average" are used. These terms were defined for purposes of this analysis by the following method: using the 41-year reservoir period of record, simulated reservoir inflow data were sorted from high to low and were then divided into three parts. The third of the data with the lowest simulated reservoir inflows were classified as dry year, the middle third as average year, and the upper third as wet year. These divisions are intended to provide relative context for discussion and evaluation of potential impacts.

The hydrology effects analysis for the No Action Alternative assumes that future conditions in Ute Reservoir will be the same as existing conditions. However, in the absence of the Project, NMISC would seek to put Ute Reservoir water to beneficial use (domestic, M&I, and irrigation uses) by pursuing other purchasers.

4.1.1 Surface Water

Potential effects on Ute Reservoir and the Canadian River from the No Action Alternative and Proposed Action are described and compared in the sections below. Potential minor, temporary effects due to Project construction would occur at Running Water Draw and Frio Draw; however, these effects would be minor and are not discussed further.

4.1.1.1 Ute Reservoir

An existing monthly mass balance model for Ute Reservoir was used to estimate the future storage in the reservoir under both the No Action Alterative and the Proposed Action (CH2M HILL 2007; Whipple 1994). The No Action Alternative is an extension of existing conditions (i.e., no Project demands on the reservoir), while the Proposed Action analysis simulates the 16,450 AF annual Project demand under the historical hydrologic conditions. The maximum effect of withdrawing 16,450 AFY is considered in this effects analysis. This approach conservatively estimates a worst-case scenario for effects on reservoir contents.

The model is a mass balance model that uses historical Ute Reservoir contents to estimate historical inflows based on 41 years of historical data from 1966 to 2007. Historical inflows are then used to simulate the No Action Alternative and the Proposed Action. Several types of studies for eastern New Mexico were reviewed to make sure the period of record for the historical reservoir contents was a reasonable representation of potential hydrology for Ute Reservoir. The Project team compared the range of hydrologic conditions in the period of record for historical reservoir contents to the range of hydrologic conditions from several longer term hydrology datasets including precipitation records, Palmer Drought Indices, and tree ring data. The historical simulation period was determined to be reasonably representative of the potential hydrologic variation (MWH 2008).

The effects of two agreements—the Compact and the Management Plan—were included in the analysis. In the model, Compact releases were simulated when Ute Reservoir storage exceeded the Compact maximum. The minimum baseflow of 3 cfs to the Canadian River was assumed to be met by continued seepage and other sources at rates similar to those that have occurred historically. A sensitivity analysis demonstrated that making dedicated releases to meet baseflow requirements would not significantly affect simulated reservoir levels over the model period.

A summary of Ute Reservoir simulation results is shown in Table 14. Effects on mean simulated reservoir storage, stage, depth, and surface area are summarized. Reservoir storage, stage, and surface area are all lower for the Proposed Action when compared with the No Action Alternative because of the Project diversions. The decrease in reservoir releases/spills of 11,050 AFY for the Proposed Action would be a benefit to the State, because the Proposed Action would utilize that water for M&I demands within the State instead of releasing it to downstream users.

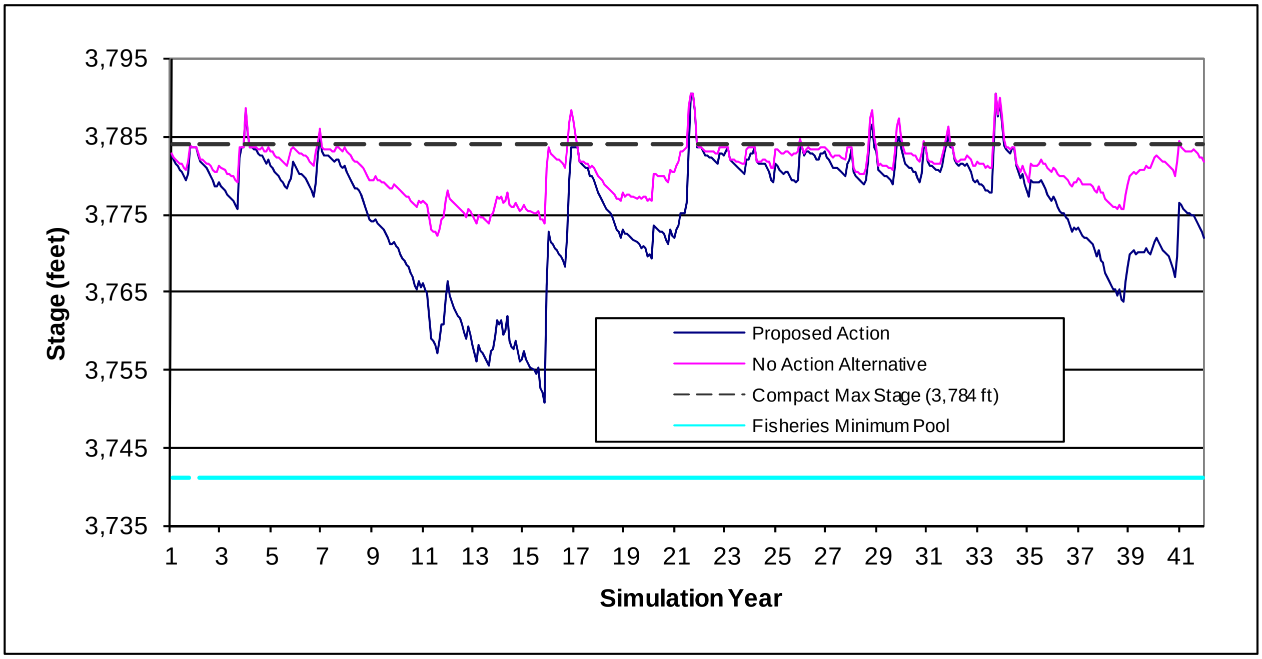
Table 14. Simulated Effects on Ute Reservoir for 1966–2007 Historical Inflows.

	Simulated Value		Effects	
	No Action Alternative	Proposed Action	Magnitude	%
Mean Annual Storage Contents (AF)	174,350	146,130	-28,220	-16
Mean Annual Reservoir Stage (ft)	3,781	3,775	-5	--
Mean Annual Reservoir Depth (ft)	73	67	-5	-7
Mean Annual Reservoir Area (ac)	6,289	5,508	-781	-12
Mean Annual Releases/Spills (AFY)	23,910	12,860	-11,050	-46

Source: MWH 2009b.

Figure 20 shows how the reservoir elevations would be different for the No Action Alternative and the Proposed Action. These elevations are based on changes in reservoir storage over the simulation period. Reservoir contents are lowest during dry periods (e.g., from simulation years 9 through 15 and simulation years 36 through 41), and the difference between reservoir contents for the No Action Alternative and the Proposed Action is greatest during dry periods. Simulated reservoir contents would never be less than the fisheries minimum pool for either the No Action Alternative or the Proposed Action. The largest difference in storage between the No Action Alternative and the Proposed Action would occur during the late spring and early summer months before the late summer rainy season. Releases through the reservoir outlet works were assumed to be made when storage was simulated to exceed the Compact maximum, but the rate of release was limited to the safe discharge rate of the outlet works of about 325 cfs. The limited release rate resulted in storage that would exceed the Compact maximum for periods when releases would continuously be made until storage was reduced within the Compact maximum.

Figure 20. Simulated Ute Reservoir Elevation (Stage) Time Series.

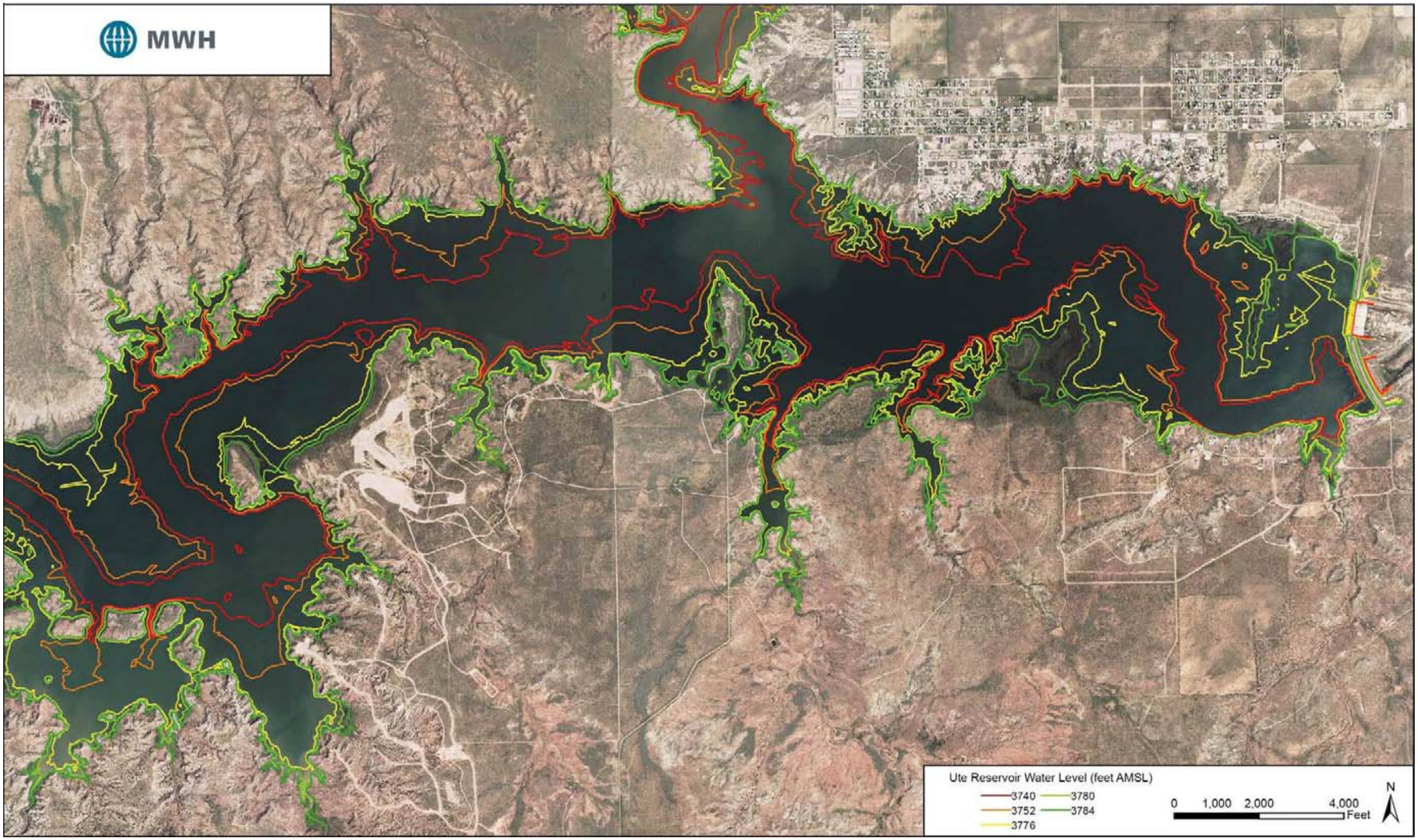


Source: MWH 2009b.

Ute Reservoir footprints are shown for a range of elevations from 3,740 to 3,784 feet asl in Figure 21, representative of the range of elevations from the fisheries minimum pool elevation (3,742 feet) to the current Compact maximum pool elevation (3,784 feet). Ute Reservoir surface area contours were based on available bathymetry data, which include contours at intervals of 4 feet. As a result, the closest matching contour to modeled reservoir elevations is shown in Figure 21. In addition to the fisheries minimum pool elevation and maximum spillway elevation, the following simulated reservoir footprints are shown in the figure:

- Average simulated reservoir stage over the 41-year simulation period for the Proposed Action (3,775 ft; closest available elevation footprint is 3,776 ft)
- Average simulated reservoir stage over the 41-year simulation period for the No Action Alternative (3,781 ft; closest available elevation footprint is 3,780 ft)
- Reservoir stage for the driest period simulated (i.e., winter of simulation year 15) for the Proposed Action (3,751 ft; closest available elevation footprint is 3,752 ft)
- Reservoir stage for the driest period simulated (i.e., winter of simulation year 15) for the No Action Alternative (3,772 ft; closest available elevation footprint is 3,776 ft)

Figure 21. Simulated Ute Reservoir Footprints.



4.1.1.2 Canadian River

Because the Canadian River baseflows were assumed to be maintained as specified in the Management Plan, the largest effect on flows in the river would be from changes in Compact releases and spills from the reservoir. The NMISC outlet structure capacity for releases is about 325 cfs. With the new water supply demands on the reservoir, there would be fewer time periods when storage in the reservoir is greater than the Compact maximum and spills are required (Table 15).

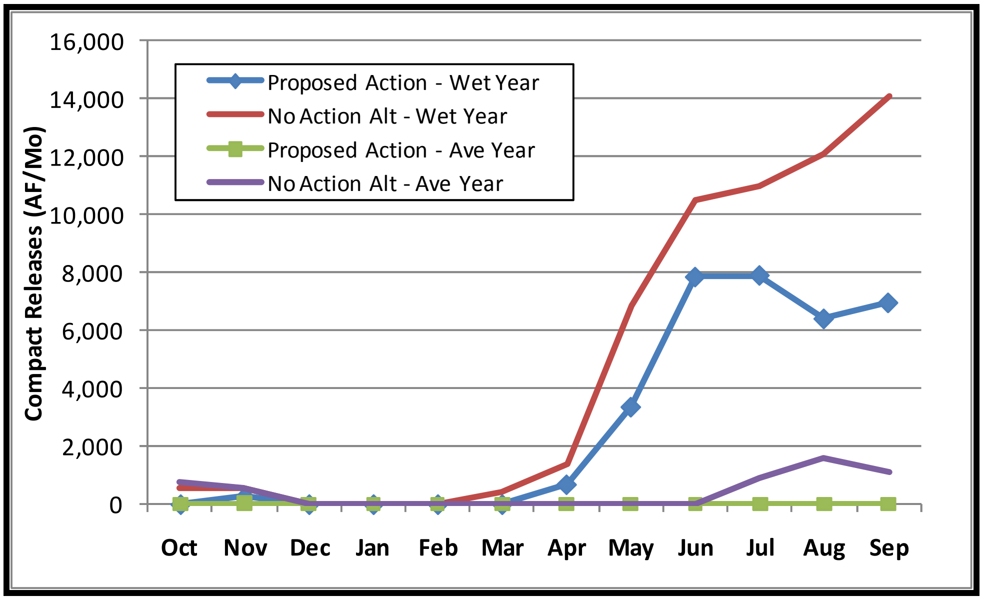
Table 15. Simulated Ute Reservoir Releases/Spills.

	Simulated Value		Effects	
	No Action Alternative	**Proposed Action**	**Magnitude**	**%**
Average annual releases/spills (AFY)	23,940	12,860	-11,050	-46
Maximum monthly releases/spills (AF/mo)	76,031	59,493	-16,538	-22
# Months Compact releases/spills	69	40	-29	-42

Source: MWH 2009b.

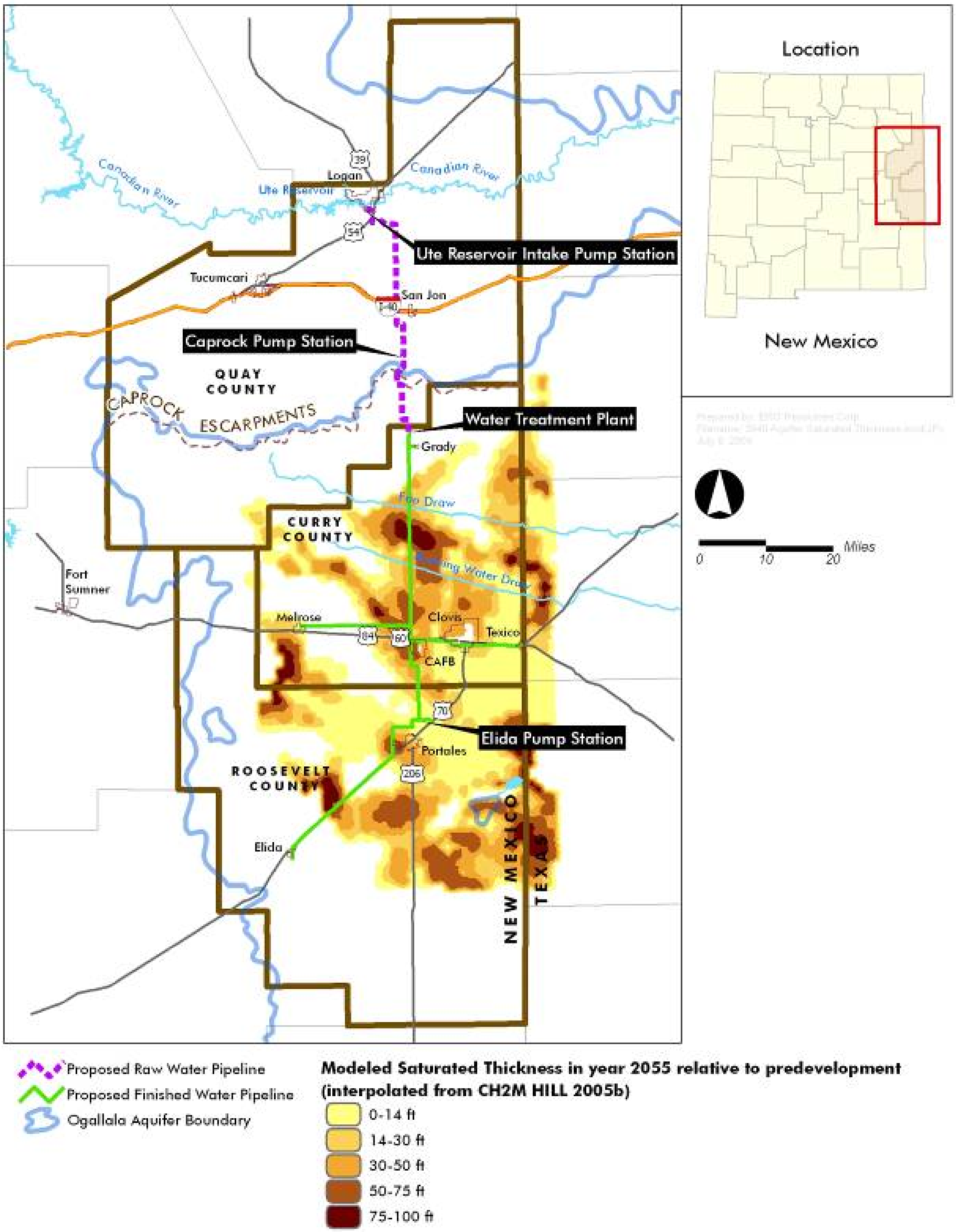
While these averages provide some useful information to compare the alternatives, they do not give a clear picture of when effects would be greatest. Differences in average annual Compact releases/spills from Ute Reservoir (Figure 22) would be greatest during wet years (about 24,000 AFY less for the Proposed Action), less for average years (about 4,900 AFY less for the Proposed Action), and the least for dry years (about 3,700 AFY less for the Proposed Action). Each of the years in the 41-year simulation period was classified as dry, average, or wet by ranking the simulated reservoir inflow for the years and dividing them into the lower third (dry years), middle third (average years), and upper third (wet years). As described above in Section 4.1.1.1, the simulation period was reasonably representative of long-term hydrological variability for Ute Reservoir. As a result, division of the 41-year simulation period based on a ranking of simulated inflow was assumed to be a reasonable approximation of identifying hydrological conditions for the simulation period (Figure 23).

Figure 22. Average Annual Releases for Average, Wet, and Dry Years.



Source: MWH 2009b.

Figure 23. Declines in Saturated Thickness for the No Action Alternative.



Source: CH2M HILL 2005b.

The average change in flow at the state line was estimated using the available gage information and an estimated transit loss of 0.16 percent per stream mile (5.8 percent total loss between Logan gage and the state line) based on existing transit loss models. Transit loss per stream mile was calculated based on estimates of transit losses between the Canadian River at the Logan gage and Canadian River at Amarillo stream gages reported in previous studies (Reclamation 1960; HDR 1987; Parkhill et al. 1992). The volume of releases/spills reaching the state line would be less than the volume at Ute Reservoir for the No Action Alternative and the Proposed Action as a result of transit losses. The magnitude of effects would be less at the state line (decrease of 10,410 AFY) than at Ute Dam (decrease of 11,050 AFY), but the effects under the Proposed Action as a percentage of No Action Alternative conditions would be the same for the two locations (46 percent decrease in releases/spills; Table 16).

Table 16. Canadian River Streamflow Effects Associated with Releases/Spills over 41-Year Simulation Period.

	Total # Releases/Spills Ute Reservoir and State Line[1]	Streamflow from Releases/Spills (AFY)	
		Canadian River below Ute Reservoir	Canadian River at State Line[2]
No Action Alternative	69	23,910	22,520
Proposed Action	40	12,860	12,110
Effects (magnitude)[3]	-29	-11,050	-10,410
Effects (percent)[4]	-42%	-46%	-46%

[1] Total number of releases/spills over the 41-year simulation period.
[2] Assumed transit loss of 0.16 percent per stream mile (5.8 percent total loss between Logan gage and state line).
[3] Effects (magnitude) calculated as (Proposed Action – No Action Alternative).
[4] Effects (percent) calculated as (Proposed Action – No Action Alternative) / No Action Alternative.
Source: MWH 2009b.

4.1.2 Ground Water

Results from previous ground water studies were used to determine the potential effects of the No Action Alternative and Proposed Action on ground water resources in the Project Area. Modeling estimated the effects of changes in ground water use on saturated thickness (the difference between the water level in the aquifer and the “bottom,” or bedrock level) in the aquifer.

4.1.2.1 Ogallala Aquifer

No Action Alternative Assumptions

Under the No Action Alternative, the existing trends of water use from the Ogallala aquifer would continue. Modeling completed for the No Action Alternative assumed that the agricultural and M&I uses would remain the same. The Ogallala aquifer would continue to be drawn down. As the saturated thickness continues to decrease, wells would produce less and more wells would have to be drilled to keep up with demand.

Proposed Action Assumptions

To determine ground water effects for the Proposed Action, M&I demands on the aquifer were assumed to decline, and agricultural demands were assumed to remain the same. The assumption also was made that the existing ratio of ground water use (i.e., 96 percent agricultural uses and 3 percent for M&I uses) would be reduced due to the Proposed Action. Supply from the Proposed Action would provide about 86 percent of the water demands in the Project Area, so that about 2,345 AFY of ground water supplies would still be needed for M&I uses in about 2060. Interpretations of previous ground water modeling results were developed for each model node where the Proposed Action would change M&I ground water withdrawals. Results were then averaged for each of the Participant areas. Although the decline in ground water levels and saturated thickness associated with M&I demands would be less for the Proposed Action, the dominating influence of agricultural demand would result in continued declines in water levels under both alternatives.

Effects of the Alternatives

The effects of the No Action Alternative and Proposed Action on fresh ground water supplies in the Ogallala aquifer would be similar due to the relatively small amount of demand for M&I supply compared to agricultural demand. Declines in saturated thickness for the Proposed Action would be slightly less than those for the No Action Alternative because of the small reduction in overall pumping as a result of the lack of M&I pumping, providing a small beneficial effect on water levels. Aquifer levels are expected to continue to decline throughout the Project Area. The severity of decline in saturated thickness varies due to differences in agricultural uses and natural variability in aquifer conditions. Table 17 shows the simulated results.

Table 17. Simulated Results for Declines in Ogallala Aquifer Saturated Thickness.

Community	2005 Saturated Thickness (ft)	Average Change in Saturated Thickness (ft)	
		No Action Alternative	Proposed Action
Clovis	69	-42	-41
Melrose	11	+2	+2
Portales	69	-41	-40
Texico	100	-97	-95
CAFB	89	-54	-52

Note: Elida and Grady saturated thickness declines were not simulated.
Source: MWH 2008.

In addition to a decrease in saturated thickness, declining ground water levels under both the No Action Alternative and the Proposed Action would continue to correspond to a decrease in well yields. Lower water levels likely would cause the aquifer formation to compress, resulting in further yield decreases. Deeper wells and additional wells would continue to be required, which would increase the cost of using ground water for M&I supply.

4.1.2.2 Other Regional Aquifers and Brackish Aquifers

The northern portion of Quay County would not be served by the Proposed Action since the towns and developments rely on fresh ground water supplies that appear to be stable. Given that there would not be changes in recharge and discharge attributable to the Project, it was assumed that there would be no ground water effects for Quay County.

The two brackish ground water formations that underlie the Ogallala aquifer would not be used for water supply under the No Action Alternative or the Proposed Action. The formations are not a feasible potable water supply due to the high costs of pumping and treatment. There would be no effects to these aquifers.

4.1.3 Water Quality

Effects to water quality in Ute Reservoir and the Canadian River are described below. As described in the previous section, there would be minimal differences in Ogallala aquifer ground water levels for the No Action Alternative and the Proposed Action. As a result, effects on Ogallala aquifer ground water quality would be similar for both alternatives and are not discussed further. Effects on brackish ground water aquifers would not occur because neither alternative would change water levels in brackish aquifers.

4.1.3.1 Ute Reservoir

The *Surface Water Hydrology Effects* section described the results of 40 years of simulated reservoir operations. In some years, the No Action Alternative and Proposed Action have similar storage levels in Ute Reservoir, as well as similar average surface area, pool elevation, and reservoir depth. The following years of the simulation period would result in different degrees of reservoir drawdown (and different storage levels) for the Proposed Action when compared to the No Action Alternative: years 10 to 15, years 18 to 21, and years 35 to 41 (further detail on simulated storage is provided in the *Surface Water Effects* section). The differences in reservoir storage in the drawdown years are likely to result in differences in reservoir stratification.

For the No Action Alternative, reservoir stage would rarely drop below levels observed in 2001 and 2006 when the reservoir was stratified (see the stratification discussion in the *Affected Environment* section). As a result, the reservoir would likely remain strongly seasonally stratified in most years for the No Action Alternative. For the Proposed Action, there would be more months when simulated reservoir depth would be less than the historical stratification depth (approximately 25 feet). This could lead to less Ute Reservoir stratification for the Proposed Action when compared to the No Action Alternative.

For the Proposed Action, during the drawdown periods, the reservoir would be 5 to 15 feet shallower than for the No Action Alternative. Consequently, more of the reservoir volume would be located near the water surface where it could be mixed by wind. In addition, the pipeline withdrawals would extract water from the reservoir's bottom and middle layer through outlets at 3,735 or 3,759 feet (about 27 or 51 feet above the reservoir bottom). Summer pipeline withdrawals would be about 1,800 AF per month, representing 1 to 3 percent of total reservoir storage during drawdown periods. In particular, withdrawals made from the lower pipeline outlet would reduce the volume of the bottom layer near the outlet, leaving more water that is completely mixed in the upper layer and partially mixed in the middle layer. Therefore, stratification may be stronger and of longer duration for the No Action Alternative than the Proposed Action.

The reduced stratification likely for the Proposed Action could have water quality benefits and drawbacks. Reduced stratification would likely result in fewer and shorter duration low dissolved oxygen events in the bottom layer compared to the No Action Alternative because oxygenated water near the surface would more often mix with water near the reservoir bottom. Fewer occurrences of low dissolved oxygen could mean there would be less release of phosphorus from reservoir sediments. Less release of phosphorus would likely result in less algae growth after the reservoir mixes each fall. However, weakened stratification could make what little phosphorus that would be released from bottom sediments available to algae near the surface earlier in the fall, while warm temperatures favor rapid algae growth. Therefore, differences in stratification may or may not result in differences in algae growth in Ute Reservoir.

Theoretical residence time (see discussion on page 45) would be substantially decreased for the Proposed Action compared to the No Action Alternative. The average study period residence time for the Proposed Action would be 31 months compared to 37 months for the No Action Alternative, a reduction of 18 percent. Shorter residence times tend to result in less algae growth as nutrients are flushed out of the reservoir at a faster rate. The potential reduction in algae growth and organic carbon for the Proposed Action, as a result of reduced residence time, would have a beneficial effect on Ute Reservoir water quality compared to the No Action Alternative. Differences in residence time also have implications for evapoconcentration, where water evaporates from the reservoir surface, concentrating dissolved constituents in the reservoir water. The shorter residence time for the Proposed Action would also result in lower concentrations of dissolved constituents in Ute Reservoir when compared to the No Action Alternative.

4.1.3.2 Canadian River

As discussed in the *Hydrology* section, the Proposed Action would result in fewer releases/spills, an average difference in volume of about 11,050 AFY, compared to the No Action Alternative. Consequently, under the Proposed Action there would be fewer days when the Canadian River would have relatively high flow and relatively low salinity, compared to the No Action Alternative (i.e., 29 fewer months of releases/spills for the Proposed Action over the 41-year simulation period). As a result of fewer infrequent releases for the Proposed Action, there would be less dilution flow on the Canadian River for these 29 months of the 41-year simulation period. However, baseflow would be the same for both alternatives, resulting in minimal changes to TDS for the majority of the time. The No Action Alternative and Proposed Action are not likely to affect attainment of water quality standards.

As shown in Table 18, the Proposed Action would result in fewer releases/spills resulting in about 9,800 tons per year less salt loading.

Table 18. Canadian River at Logan Gage – Estimated Salt Loading.

	Salt Loading (Tons/Year)			Streamflow at Logan Gage[3] (AFY)
	Baseflow[1]	Releases/ Spills[2]	Total	
No Action Alternative	13,600	21,200	34,800	26,110
Proposed Action	13,600	11,400	25,000	15,060
Effects (magnitude)[4]	0	-9,800	-9,800	-11,050
Effects (percent)[4]	0	-46%	-28%	-44%

[1] Based on a constant baseflow of 3 cfs and TDS equal to historical median of 4,530 mg/L.
[2] Based on simulated Compact releases and TDS equal to Ute Reservoir historical median of 650 mg/L.
[3] Streamflow at Logan gage estimated as simulated Compact releases plus 3 cfs constant baseflow.
[4] Magnitude of effects are calculated as (Proposed Action - No Action Alternative). Effects (%) are calculated as (magnitude of effects/No Action Alternative).
Source: MWH 2009c.

Differences in average annual TDS between the No Action Alternative and Proposed Action would vary depending on hydrologic conditions. The average annual TDS would be associated with differences in the makeup of Canadian River streamflow. Because TDS concentrations at the Logan gage are a weighted average of TDS from baseflow (4,530 mg/L historical TDS) and releases/spills (650 mg/L historical TDS), average TDS concentrations would be higher for periods of low streamflow when there are few releases/spills. The range of TDS concentrations occurring in any given year would be about the same.

4.1.4 Fluvial Geomorphology

No Action Alternative

Under the No Action Alternative, the Canadian River would continue to be in a state of equilibrium, with some minor channelization upstream of the Revuelto Creek confluence continuing as a result of low sediment concentrations in streamflow downstream of Ute Dam.

Proposed Action

The Canadian River from Ute Dam to the state line is predominantly in geomorphic equilibrium, with minor channelization that is occurring upstream of Revuelto Creek as a result of low sediment concentrations in the streamflow (MWH 2008). Streamflow effects for the Proposed Action would be a decrease in the duration and frequency of Compact releases and Reservoir spills. A decrease in Compact releases and Reservoir spills would likely lead to the following geomorphic effects:

- **Decreased removal of sediment associated with high flows, which would decrease the hydraulic capacity of the river to convey flood flows and releases/spills from Ute Reservoir.** Flood flows are generally small in magnitude and infrequent for the Canadian

River downstream of Ute Dam and upstream of Revuelto Creek because of dam operations (MWH 2008). However, when flood flows do occur, more frequent overbank flows could result due to reduced channel capacity.

- **Increased growth of riparian vegetation along the streambank as a result of decreased scouring flows.** The increase in riparian vegetation would cause an increase in hydraulic roughness in the overbank zone, which would decrease the hydraulic capacity of the river to convey flood flows and high flow releases/spills from Ute Reservoir. Similar to the effects described in the previous paragraph, the increase in riparian vegetation would have a minor adverse effect on the conveyance of Ute Reservoir releases and increase the frequency of overbank flows.
- **Increased deposition** also could result in more braided stream channel, and enhanced opportunity for overbank flooding.

Geomorphic effects for the Canadian River downstream of the confluence with Revuelto Creek would be similar, but would be smaller in magnitude than effects upstream of the confluence. Revuelto Creek would continue to supply the flood flows that maintain the existing stream geomorphology, and, as a result,geomorphic effects would be expected to be negligible downstream of Revuelto Creek.

4.2 Recreation

The No Action Alternative and the Proposed Action would have potential adverse and beneficial effects on recreation that vary throughout the Project Area. Because potential recreation effects for Curry and Roosevelt counties would be similar, they are discussed together; Quay County effects are discussed separately.

4.2.1 Curry and Roosevelt Counties

No Action Alternative

Under the No Action Alternative, recreation resources in Curry and Roosevelt counties could be adversely affected by future water shortages. Reductions in “discretionary” uses, such as irrigation of public parks and golf courses, could occur when ground water declines become more severe. For example, the City of Clovis Drought Management Plan calls for limiting outdoor landscape watering for parks and closing public pools when demand increases to certain levels relative to available supplies (City of Clovis 2007). The extent of these impacts depends on many factors, including the rate of future aquifer declines and the volume of future demands. However, in general, the No Action Alternative would have an adverse effect on recreation resources in Curry and Roosevelt counties within the Project planning horizon.

Proposed Action

Under the Proposed Action, recreation resources in Curry and Roosevelt counties would remain the same or improve. The Proposed Action would provide a sustainable water supply for all uses, including recreation facilities in the two-county area.

4.2.2 Quay County

No Action Alternative

Under the No Action Alternative, recreation resources in Quay County would generally be similar to existing conditions in the short term. Ute Reservoir levels would remain at approximately the same levels as in the past. Under both existing conditions and the No Action Alternative, Ute Reservoir water levels periodically decrease below the 3,777 foot level where visitor use of facilities may begin to be affected. This is predicted to happen about once every 5 years (22 percent of the time) under the No Action Alternative.

While there would be no difference in lake levels between the No Action Alternative and existing conditions in the short term, NMISC is determined to ensure that the 24,000 AF of Ute Reservoir supply allocated to M&I use is ultimately used for those purposes. If the ENMWUA is unable to use this water, NMISC will look for other ways to use Ute Reservoir water for M&I demands.

In the long term, other indirect effects to Quay County recreation could occur because economic effects in Curry and Roosevelt counties may affect the number of visitors to ULSP. These effects are difficult to calculate because of the lack of historic information about ULSP visitors.

Proposed Action

Recreation opportunities in Quay County—specifically at Ute Reservoir—could be affected by changes to reservoir levels under the Proposed Action. These effects could take the form of decreased visitation due to decreased accessibility to recreation facilities, or decreases due to reduced desirability of the recreation resources at lower lake levels.

During interviews with Ute Reservoir private boat dock owners, several concerns were expressed related to the Proposed Action including potential impacts to recreation due to changes in the aesthetics of the Reservoir, operation of private boat docks, and quality of recreation.

Changes to lake levels could have an effect on the accessibility and usability of the recreation facilities around Ute Reservoir, including the marina and boat ramps. Based on existing information, it appears that at about 8 feet below “full’ conditions (about 3,777 feet), some of the public facilities around Ute Reservoir would begin to be affected. Over the next 40 years, this condition would occur about once every 2 years (about 51 percent of the time) under the

Proposed Action. However, it is likely that a series of drier years would lead to several years in a row with lower lake levels, rather than every other year or every third year. Additional information about lake levels is discussed in the *Hydrology* section.

Table 19 shows projected visitation at ULSP under the No Action Alternative and the Proposed Action. The effects of lake levels on visitation are very difficult to predict because other factors are involved. Factors that affect how many visitors come to ULSP include general economic conditions in the State and water levels at other water-based recreation areas in the State or nearby areas. For example, low water levels at Brantley Lake and Conchas Lake could encourage visitors to use Ute Reservoir.

The relationships between lake levels and visitation at three other regional reservoirs that have experienced greater variability in lake levels than Ute Reservoir in recent years (Conchas Lake, Elephant Butte Reservoir, and Lake Meredith) were examined. Based on those evaluations, it was estimated that there would be little or no effect on visitation from lower levels at Ute Reservoir up to an 8-foot decline below full conditions. Beyond an 8-foot decline, visitation could decrease by about 1 percent for every 2 percent further decrease in storage contents (during May through September only). Applying these assumptions to the projected hydrology of Ute Reservoir under the Proposed Action, the average annual visitation at ULSP was projected to be about 6 percent lower under the Proposed Action than under the No Action Alternative or existing conditions. In the driest year, there would be a larger impact on visitation. Table 19 summarizes these results.

Table 19. Projected Annual ULSP Visitation (+/- 50%).

	No Action Alternative	**Proposed Action**
% of years with potential low water conditions	22%	51%
Projected average annual visitation*	318,000	299,000
Proposed Action percent reduction in visitation compared to the No Action Alternative*	NA	-6%
Minimum visitation in driest year*	306,000	230,000

*This estimate has an approximate uncertainty of +/- 50%.
Source: BBC 2009.

4.3 Socioeconomics

The No Action Alternative and the Proposed Action would have potential adverse and beneficial effects to social and economic conditions that vary throughout the Project Area. Because potential effects for Curry and Roosevelt counties would be similar, they are discussed together; Quay County effects are discussed separately.

4.3.1 Curry and Roosevelt Counties

No Action Alternative

Under the No Action Alternative, Curry and Roosevelt counties would continue to rely on ground water. As this nonsustainable resource is depleted, the following effects may occur:

- Water supply costs for municipalities and NMAW would increase, with rate increases for customers;
- Economic development likely would decline due to water supply problems for existing and new business and residents;
- Growth in construction would slow or cease due to potential “tap moratoriums”;
- Water use restrictions would increase;
- Residents and businesses may migrate out of the area; and
- Purchases of agricultural lands for M&I water supply would accelerate retirement of those lands and diminish the economic contribution from agriculture.

A comparative evaluation performed for the ENMWUA of the costs of continuing to rely on ground water resources (e.g., the No Action Alternative) estimated the present worth costs of this approach at about $500 million over the next 25 years (CH2MHILL 2005a).

Proposed Action

Under the Proposed Action, the Participating Communities would incur costs to construct and maintain a new sustainable water supply from Ute Reservoir. Short-term benefits during construction would include the addition of about 313 new jobs over the 5-year construction period. This assumes that local labor is used for construction, and represents an increase in regional employment of less than 1 percent. Long-term costs of a portion of the construction expenditures and all of the operation and maintenance requirements of the water supply system would be paid by the Participating Communities. The costs were assumed to be spread across the Participating Communities based on their apportionment in the NMISC and UWC contract. These costs would result in increased water fees for residents and businesses in the Project Area, relative to existing conditions. The total expected construction costs for the Participating Communities is about $37 million. Annual operations and maintenance costs depend on the amount of water used by the Participating Communities in a given year. For example, the total operation and maintenance costs in 2012 were estimated to be about $5.5 million—assuming all M&I water comes from Ute Reservoir (i.e., no ground water use). This estimate is based on population projections and assumes average annual water use per-connection remains constant. The cost to customers (on a per-connection basis) is anticipated to increase average annual water costs by about $164 to $404 during the early years of the planning horizon (about 2017) and would decrease to about $138 to $302 annually by the end of the planning horizon (about 2043). Tap fees for new connections are anticipated to increase as well, with a range for the Participating Communities from about $928 to $5,566.

In the short term, these increases to water rates and tap fees are likely to exceed any increases adopted under the No Action Alternative. However, in the long term, these costs are anticipated to be lower than the financial and economic costs to the Participating Communities under the No Action Alternative. The comparative cost evaluation performed by CH2M HILL for the ENMWUA in 2005 estimated the net present worth costs of the Proposed Action to be about 7 percent lower than the costs of relying on ground water supplies over the next 25 years. The Proposed Action also offers much greater sustainability than relying on ground water (CH2M HILL 2005a).

4.3.2 Quay County

No Action Alternative

In the short term, Ute Reservoir hydrology would represent a continuation of existing conditions under the No Action Alternative. There would be no direct effects from the No Action Alternative on Quay County socioeconomic conditions. In the long term, declining socioeconomic conditions in Curry and Roosevelt counties would likely have adverse effects on the region as a whole. In addition, NMISC is determined to ensure that the 24,000 AF of Ute Reservoir supply allocated to M&I use is ultimately used for those purposes. If the ENMWUA is unable to use this water, NMISC will look for other ways to use Ute Reservoir water for M&I demands.

Proposed Action

Anticipated effects of the Proposed Action on the socioeconomic conditions in Quay County include short-term economic benefits from construction and changes to the recreation-based economy and property values around Ute Reservoir. During interviews with Ute Reservoir private boat dock owners, several concerns were expressed related to the Proposed Action including potential impacts to the local economy (Quay County) and quality of life in the Logan area. Boat dock owners also expressed concerns about construction costs and the annual operation and maintenance costs of the Proposed Action.

Some of the economic benefits from Project construction would likely occur in Quay County. About 40 jobs during the 5-year construction period are anticipated, an employment increase of about 1 percent. Annual economic benefits to Quay County from construction activities are projected to be about $4 million, including labor income from the jobs created.

The Proposed Action would result in changes to Ute Reservoir water levels, which could affect tourism and the recreation-based portion of Quay County's economy. It is important to note that there is considerable uncertainty in these estimates due to the uncertainty of projected changes to annual visits to Quay County and ULSP. The estimates have a level of uncertainty of at least +/- 50 percent. The 6 percent average decrease in annual visitation would result in an annual average decrease of about $1 million to the Quay County economy. About 19 jobs throughout Quay County could be affected by the decrease in visits due to lower lake levels.[1] With the uncertainty in these estimates, there could be a potential range of effects in decreased gross receipts for Quay County of $500,000 to $1.5 million and a decrease in jobs from 9 to 28.

These best estimates based are on the projected effects of the Proposed Action on Ute Reservoir levels and storage contents, and the water level condition of other reservoirs in the region with variable lake levels (e.g., Brantley and Conchas reservoirs). However, given the historically consistent reservoir levels at Ute Reservoir, and the lack of detailed surveys of Ute Reservoir visitors, these estimates are only approximations of how variation in lake levels may affect local economic conditions.

Under the Proposed Action, water levels are expected to generally decrease compared to the historical water levels observed at Ute Reservoir. Under some conditions, the decreased water levels could have negative effects on water access, aesthetics, and crowding. These effects could result in declines in property values adjacent to the reservoir. Lakefront homes and lakeview homes could potentially be affected. The topography of Ute Reservoir varies along the shoreline, with some steep, cliff-like areas where the shoreline does not vary with water level, and some shallow areas where the shoreline is variable at different water levels. The different areas can be seen in Figure 21. Most areas along the reservoir have little variation in shoreline down to an elevation of about 3,772 feet. At water levels of about 3,760 to 3,772, some developed residential areas would be several hundred feet from the shoreline, while some areas would change little. At these water levels, there would be wider areas of exposed shoreline near the lakefront properties in west Logan Village and near the southern portions of 12 Shores at Ute Lake.

The concept of "locational premiums" is discussed in Section 3.2.2.23 which begins on page 55. To estimate the potential effects on property values for lakeview and lakefront properties, the following simplified assumptions were made:

- Locational premiums would be about 25 to 50 percent less when the lake levels are between 3,772 and 3,760 feet in elevation; and

[1] Based on data provided in Table 7 and Table 19.

- Lakefront and lakeview premiums would be about 50 to 100 percent less when the lake is below 3,760 feet.

These are broad generalizations; homes near steep shorelines would not be affected as much as homes near shallow (flat) shorelines.

Based on the lake level analysis, reservoir levels would be between 3,772 and 3,760 feet about 21 percent of the time under the Proposed Action and would be below 3,760 feet about 8 percent of the time. Using the hydrology analysis combined with the assumptions in the bulleted list above, the Proposed Action is anticipated to reduce the locational premium for lakefront and lakeview properties by about 9 to 18 percent over the 40-year forecast period. This calculation is shown below:

25% to 50% reduction about 21% of the time, plus 50% to 100% reduction about 8% of the time: (25% *21%)+(50%*8%) = 9.25% to (50% *21%)+(100%*8%) = 18.5%

To illustrate this concept by example, assume that a lakefront property worth $500,000 has an estimated locational premium of $250,000 when the lake is near-full. The property's estimated premium would be reduced to $204,000 to $227,000 under the Proposed Action, reducing the total property value to about $454,000 to $477,000. A lakeview property that is worth $375,000 has an estimated locational premium of $125,000 when the lake is near-full. The property's estimated premium would be reduced to about $102,000 to $113,000 under the Proposed Action, reducing the total property value to $352,000 to $363,000.

These anticipated impacts are general, order of magnitude estimates. They represent average effects on property values over the 40-year hydrology modeling period. Effects on some properties would be more and some would be less. Also, effects on property values would be greater during extended periods of low reservoir levels (during drought periods), and there would be less effect during extended wet periods when the reservoir would be full under both the No Action Alternative and the Proposed Action.

4.4 Threatened and Endangered Species

4.4.1 Interior Least Tern

A model simulation of Ute Reservoir levels suggest that reservoir levels would be lower under the Project (MWH 2009b). Lower reservoir pool levels at Ute Reservoir would potentially expose additional shoreline and could create new interior least tern habitat. Based on a review of current conditions and bathymetry, it does not appear that large expanses of unvegetated rocky or sandy substrate would be exposed at lower lake levels. Annual vegetation establishes quickly in flatter topography, and many areas of the reservoir shoreline are steep and would preclude interior least tern nesting.

In addition, if interior least terns nest along the reservoir shoreline in suitable habitat exposed during low reservoir levels, there are no operational components of the Project that would result in rapid lake rise and inundation of nests.

4.4.2 Lesser Prairie-Chicken

Pipeline construction could temporarily affect lesser prairie-chicken habitat in the area between the Caprock and the City of Clovis. The ENMWUA would coordinate closely with the NMDGF to develop avoidance measures to eliminate or minimize impacts to this species. Those mitigation measures may include:

- Completing lesser prairie-chicken surveys in coordination with NMDGF during construction of the Project;
- Avoiding or minimizing construction activities during leking and nesting season when active leks or nests are near the Project Area;
- Completing clearing and construction during nonactive seasons; and
- Coordinating with NMDGF regarding revegetation seed mixes and measures to benefit the lesser prairie-chicken.

4.4.3 Arkansas River Shiner

Modeled changes to releases/spills from the Project could potentially affect downstream habitat for the shiner. Table 20 is a summary of important habitat components for the shiner, and the potential effects from the Project. Additional details are included in the BA for the Project.

Table 20. Habitat Components and Potential Effects to the Arkansas River Shiner.

Habitat Component	Potential Effect of the Project
Canadian River baseflow	No effect. Maintenance of baseflow (3 to 5 cfs) is a Management Plan requirement.
Canadian River flows	Decreased duration and frequency of Compact releases/spills could change shiner habitat for better or for worse.
Canadian River fluvial geomorphology	Decreased total flows from Ute Reservoir releases/spills (Ute Dam release flows approximately 325 cfs) upstream of Revuelto Creek confluence; Revuelto Creek flows provide scouring downstream of confluence.
Canadian River riparian vegetation	Potential for increased growth of riparian vegetation along the streambank as a result of decreased scouring flows (upstream of Revuelto Creek confluence); minimal effects downstream of confluence. Control of

Habitat Component	Potential Effect of the Project
	riparian vegetation is a Management Plan requirement.
Canadian River flood flows	No change from existing conditions except for small reduction in spills from Ute Reservoir; Revuelto Creek provides flood flows adequate in magnitude and frequency to trigger spawning.
Canadian River water quality	Changes in Ute Reservoir releases/spills would change the annual average TDS concentration in the Canadian River, but would not change the normal range of concentrations.
Revuelto Creek habitat	Creek crossing would be accomplished via trenchless technology. No direct impacts to Revuelto Creek habitat would occur. The shiner may temporarily avoid the project area habitat during boring due to noise and vibratory effects.

In summary, the Project would not result in a significant change to habitat components from existing conditions. The Management Plan requires maintenance of existing base flow. The Project would change the duration and frequency of releases due to Compact compliance, but would not change flood flows in Revuelto Creek that maintain downstream habitat geomorphology, manage riparian vegetation, and may trigger spawning. The Management Plan also requires saltcedar control, which is completed along the Canadian River and Revuelto Creek by CRMWA. Finally, the range of TDS concentration and other water quality parameters would not change as a result of the Project. The Service has concurred with the determination that the project will not likely adversely affect the shiner and its habitat.

4.5 Vegetation and Wetlands

No Action Alternative

There would be no direct impacts to vegetation and wetlands under the No Action Alternative. Indirect effects of the No Action Alternative include continued conversion of irrigated agriculture to dryland or nonagricultural uses as agricultural water rights are purchased for M&I uses.

Proposed Action

The Proposed Action would result in both permanent and temporary effects to vegetation resources in the Project Area from placement of facilities (Table 21). There is a slight potential for changes to vegetation along the Canadian River due to changes in releases/spills from Ute Dam.

About 43.6 acres of permanent impacts would occur as a result of the Proposed Action, most of which would occur in shortgrass prairie. These impacts would be from construction of facilities such as the intake structure, WTP, and pump stations. There would be approximately 2,210.4

acres of temporary impacts from pipeline construction, assuming the entire temporary construction easement is affected. Actual construction impacts likely would be less. All temporary disturbance areas would be seeded after final grading is complete.

Wetlands and playas are generally considered important because they provide habitat for a high number of plant and animal species. Wetlands associated with Revuelto Creek may be temporarily impacted by trenching associated with pipeline construction. The area of impact to wetlands associated with Revuelto Creek will be small and will likely be re-colonized by surrounding vegetation following construction.

Indirect impacts to vegetation could occur along the Ute Reservoir shoreline. There is a possibility that tamarisk could invade portions of the Ute Reservoir shoreline, particularly during prolonged periods of lower reservoir levels which would expose more shoreline. Over the long term, fluctuations and an eventual increase in reservoir levels during wet hydrologic cycles would be detrimental to satlcedar that has established, because this species cannot tolerate period of inundation longer than about three months (Paradzick, pers. comm 2010). As reservoir levels increase and decrease, annual wetland and vegetation likely would shift to remain closer to the water level. About 123 acres of wetland fringes occur along the shoreline of Ute Reservoir, and these fringes appear to persist as water levels rise and fall in the existing elevation range. Many wetland pockets and fringes occur near drainage inlets, and these wetlands are likely to persist due to normal rainfall. Other wetland areas occur on shallowly inundated islands and peninsulas, and these areas are likely to expand and contract based on the surface area exposed to water. If reservoir levels remain lower than historic levels, semipermanent shifts in vegetation communities along the shoreline may occur and the health of wetland and other vegetation communities may decline as they lose supportive hydrology. It is likely that the approximate acreage of wetland fringe along the shoreline would remain constant at about 123 acres.

Table 21. Permanent and Temporary Direct Impacts to Vegetation Communities.

Vegetative Community	Permanent Impacts (ac)	Temporary Impacts (ac)
Agriculture		309.6
Closed conifer woodlands		3.5
Disturbed and fallow		248.7
Mesic mixed grasslands		2.1
Midgrass prairie		320.8
Mesquite midgrass prairie	2.8	22.2
Mesquite shortgrass prairie	3.7	328.5

Vegetative Community	Permanent Impacts (ac)	Temporary Impacts (ac)
Mixed shrub steppe		177.3
Open juniper woodlands		11.5
Playa		0.4
Shortgrass prairie	37.0	445.7
Rock outcrops		0.4
Riparian woodland		0.9
Urban		338.3
Wetland		0.5
Total	**43.5**	**2210.4**

Ground-disturbing activities may result in an increase in noxious weeds. Best management practices (BMPs) for weed control would be implemented to prevent permanent degradation of vegetation communities in the Project Area. Seeding with native species, and limiting non-native cover crops to annual and non-invasive sterile species, would minimize expansion of noxious weeds.

4.6 Wildlife Resources

No Action Alternative

The No Action Alternative would result in no change in existing conditions and would have no effect on wildlife resources in the Project Area.

Proposed Action

Permanent and temporary impacts to vegetation communities listed in Table 21 would affect the wildlife species associated with each habitat type. Most impacts would be temporary because the pipeline corridor would be reseeded following construction and final grading. Habitat value and use likely would be restored within 1 to 10 years following construction, depending on habitat type. Use of escape ramps during pipeline construction and closure of the trench as soon as possible after pressure-testing of the pipeline would minimize trapping of wildlife during trenching operations.

Facilities and components associated with the Proposed Action have been designed to avoid wetlands and playas, which contain a higher species diversity compared to surrounding upland areas. The current pipeline alignment specifically avoids playas that occur near the alignment. Boring rather than trenching the Revuelto Creek crossing would further avoid impacts to wetlands and other waters of the U.S. Wetlands within the Project area are associated with perennial and ephemeral drainages and would be temporarily impacted from trenching.

Trenching would temporarily reduce the holding capacity of wetlands associated with drainages. Most wildlife species would likely avoid these areas during construction, and would temporarily migrate to other suitable habitat associated with the same drainage. The Proposed Action would not affect the holding capacity of any playas in or near the project area because they would be avoided.

Vegetation communities with large shrubs and trees would require a longer time to return to pre-disturbance conditions. It is likely that most species would temporarily avoid the pipeline alignment and facility locations while construction activities are underway because of noise and human activity. Any clearing that takes place prior to facility installation could potentially disturb birds during nesting season. Take of migratory bird nests is prohibited by the Migratory Bird Treaty Act; therefore, as much clearing as possible should be conducted during non-nesting season (normally September through April 1). If clearing must take place during the nesting season (April to August), nest surveys would be completed prior to ground-disturbing activities.

Measures to eliminate or minimize impacts to the lesser prairie-chicken including coordinating with the NMDGF to complete surveys where necessary to identify active leks or nests in the project area, and to implement timing restrictions for pipeline sections or facilities that would impact active leks or nests.

During periods when the reservoir is drawn down, wildlife likely would have to migrate further to water.

The Proposed Action would not result in water levels below the fisheries minimum pool, which was designated by the NMISC and NMGFD to protect the Ute Reservoir fishery. As noted previously, some game fish reproduce successfully enough to maintain recreational fishing in Ute Reservoir. Walleye and largemouth bass do not maintain levels needed for recreational fishing and, therefore, walleye are stocked annually and largemouth bass are stocked occasionally. The proposed action may have a minor immeasurable impact to the fishery of Ute Reservoir due to decreased reproductive success of fish that currently maintain populations through natural reproduction. The predicted elevation of the shoreline between April and June under the Proposed Action would be lower overall, including in spring or early summer when most of the game fish species spawn. No impacts are anticipated to occur to the natural reproduction of white bass as these fish spawn from mid-April to mid-May and deposit eggs in water 2.0-6.9 ft deep (Becker 1983). Eggs hatch in 2-5 days and the fry are planktonic and remain in shallow water (1-2 m below the surface), eventually migrating to deeper waters when they reach approximately 10 mm in length (Becker 1983). This reproductive life history of lack of spawning in extremely shallow water, short incubation period, and the lack of dependence of fry on very shallow habitats indicate that the Proposed Action should not affect the reproduction of white bass.

Currently, NMGFD monitors Ute Reservoir through spring electrofishing and fall gill netting surveys. Such monitoring activities will allow for determination any unanticipated affects on the sport fishery of Ute Reservoir.

Potential impacts to the paper pondshell are uncertain and it is not known if this mussel has ever established populations in the reservoir or if recorded specimens represent accidental introductions.

The effects on the Arkansas River speckled dace and the suckermouth minnow from the Proposed Action would be the same as for the Arkansas River shiner and would not result in a significant change to habitat components from existing conditions. As stated previously, the Arkansas River Shiner Management Plan requires maintenance of existing base flow. While the Proposed Action would change the duration and frequency of releases due to Compact compliance, it would not change flood flows in Revuelto Creek that maintain downstream habitat geomorphology, manage riparian vegetation, and may trigger spawning.

4.7 Geology, Climate, Soils, and Air Quality

No Action Alternative

The No Action Alternative would result in additional drilling in the Ogallala aquifer for water supply wells. Minor changes to existing conditions would occur, and would have little effect on geology, climate, soils, or air quality.

Proposed Action.

Impacts to geology resources within the pipeline corridor and proposed facility locations would occur. The impacts would be limited to the pipeline and facility easements and footprints, totaling about 45 acres of permanent impacts and 2,200 acres of temporary impacts.

Limited temporary impacts to soils categorized as “Prime Farmland if Irrigated” and “Farmland of Statewide Importance” would occur. No permanent impacts to any areas classified as “agricultural” would occur, and about 310 acres of temporary impacts would occur. Construction disturbance would increase the possibility of increasing both wind and water erosion of soils in the Project Area; however, no soils categorized as “highly erodible” occur in the Project Area.

Construction activities associated with the Proposed Action have the potential to increase airborne dust matter (PM10) and other pollutants due to truck traffic and construction-related fugitive dust and diesel exhaust emissions. A primary source of fugitive (airborne) dust is earthmoving equipment associated with trench excavation and filling. Dust could also be generated from truck traffic using haul roads and work areas. Soils that are cleared and destabilized would likely become a source of wind-blown dust until stabilization efforts are implemented. These impacts would be temporary and localized, and no soils classified as "highly erodible" occur in the Project Area. Mitigation strategies and BMPs that would decrease potential impacts to air quality include:

- Use standard dust abatement practices during construction;
- Maintain adequate soil moisture on unpaved roads, staging areas, and other cleared areas;
- Halt earth-moving activities during high winds; and
- Stabilize and reseed disturbed areas as quickly as feasible.

4.8 Cultural Resources

No Action Alternative

The No Action Alternative would result in no change in existing conditions and would have no effect on cultural resources.

Proposed Action

Reclamation is in the process of consulting with the SHPO on the Project. The Proposed Action may affect cultural resources that are eligible for listing in the NRHP. Any eligible sites would be monitored during construction, and would be mitigated per the Programmatic Agreement (PA) that has been executed between Reclamation, the SHPO, and the ENMWUA with regard to resolving adverse effects on historical resources along the entire length of the pipeline on both private and federal lands. Implementation of the PA follows the normal regulatory process as described by the Advisory Council on Historic Preservation in 36 CFR 800.5 and 36 CFR 800.11. A mitigation strategy and data recovery plan will be developed as part of the PA, and may include construction monitoring in some parts of the Project Area.

4.9 Indian Trust Assets

No ITAs have been identified in the Project Area. No impacts to ITAs are anticipated from either the No Action Alternative or the Proposed Action.

4.10 Environmental Justice

No Action Alternative

Under the No Action Alternative, adverse socioeconomic impacts from diminishing water supplies on the residents of Portales could be considered an environmental justice concern, based on the relatively high incidence of households living below poverty levels in that community.

Proposed Action

Under the Proposed Action, the largest adverse economic effects would not be expected to occur in low-income or minority communities; therefore, these effects are not an environmental justice issue.

4.11 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments involve the use of nonrenewable resources and the effects of use on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy and minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as extinction of a threatened or endangered species or the disturbance of a cultural resource. Neither the Proposed Action nor the No Action Alternative would result in a large commitment of nonrenewable resources.

Project construction would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by construction equipment and vehicles. The Proposed Action would result in unavoidable harm or harassment of some wildlife, including special status species. The Project would not jeopardize the continued existence of any species.

Chapter 5. Cumulative Impacts

Cumulative effects are the direct and indirect effects of a proposed project alternative's incremental effects when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR, Part 1508.7). NEPA recommends that federal agencies identify the temporal and geographic boundaries of the potential cumulative effects of a proposed action (CEQ 1997). For purposes of this EA, the temporal boundary of analysis is from approximately 2010 to 2060, which represents the project planning horizon. However, forecasting potential cumulative effects 50 years in advance is difficult, and most of the cumulative effects analysis is general and qualitative in nature.

5.1 Reasonably Foreseeable Actions

5.1.1 Twelve Shores at Ute Lake and Quay County Entity Water Use

Entities in Quay County, including those representing the residential development Twelve Shores at Ute Lake, formerly known as Ute Lake Ranch, have a combined allocation of 7,550 AFY of Ute Reservoir water under the 1997 USC/UWC Water Contract. Determining the amount of water that may reasonably be used by these entities requires reviewing permitting/platting information, potential population change leading to demand changes, and other factors that are challenging to predict. Rather than predicting an absolute amount of future water use, a "low" and "high" estimate were modeled and analyzed. The entire combined water reservation was used as the "high" estimate, and the demand for Ute Reservoir withdrawals was assumed to be 24,000 AFY for this scenario (Table 22; CE-High). For the "low" estimate, the portion of the reservation that would be needed to meet anticipated demands associated with land development that is permitted/platted was used (Table 22; CE-Low). The Twelve Shores golf course has been permitted/platted through Quay County, with the first nine holes constructed, and currently requires about 500 AFY of raw water (Garside, pers. comm. 2009). The residential portion of Twelve Shores and the area development that is permitted/platted currently uses existing on-site wells and water pumped from Logan's well fields for potable water.

Table 22. Simulated Results and Cumulative Effects for Ute Reservoir Conditions.

	Simulated Value				Effects (Magnitude)[2]			Effects (Percentage)[2]		
	NAA	**DE–PA**	**CE–Low**	**CE–High**	**DE-PA**	**CE–Low**	**CE-High**	**DE-PA**	**CE–Low**	**CE-High**
Storage (AF)										
Min	122,040	50,140	47,590	26,410	-71,900	-74,450	-95,630	-59%	-61%	-78%
Ave	174,350	146,130	145,020	129,240	-28,220	-29,330	-45,110	-16%	-17%	-26%
Stage (ft)										
Min	3,772	3,751	3,750	3,738	-21	-22	-34	-1%	-1%	-1%
Ave	3,781	3,775	3,775	3,771	-6	-6	-10	0%	0%	0%
Depth (ft)										
Min	64	43	42	30	-21	-22	-34	-33%	-34%	-53%
Ave	73	67	67	63	-6	-6	-10	-8%	-8%	-14%
Area (ac)										
Min	4,923	2,499	2,401	1,568	-2,424	-2,522	-3,355	-49%	-51%	-68%
Ave	6,289	5,508	5,475	4,996	-781	-814	-1,293	-12%	-13%	-21%
Total Releases[1] (AFY)										
Min	0	0	0	0	0	0	0	0%	0%	0%
Ave	23,910	12,860	12,590	9,011	-11,050	-11,320	-14,899	-46%	-47%	-62%
Max	210,610	148,170	146,300	113,295	-62,440	-64,310	-97,315	-30%	-31%	-46%
# Months Releases/Spills	69	40	38	27	-29	-31	-42	-42%	-45%	-61%

NAA =No Action Alternative; DE-PA = Direct Effects under the Proposed Action; CE-Low = Cumulative Effects-Low; CE-High = Cumulative Effects-High.

[1] Total releases include releases/spills made to meet the Compact requirement of 200,000 AF maximum conservation storage between Conchas and Ute dams, and spills through the Ute Reservoir spillway.

[2] Direct and cumulative effects calculated relative to the No Action Alternative.

As Table 22 shows, the "low" end of the cumulative effects would be very similar to the impacts from the Proposed Action. The "high" end of the cumulative effects range would be greater than the Proposed Action, as shown in the right-hand column of Table 22. Figure 24 shows the projected changes in Ute Reservoir storage from both the "low" end and "high" end of demands from Quay County and 12 Shores at Ute Lake. Figure 25 represents the simulated reservoir releases/spills during a variety of hydrology conditions—dry, average, and wet years. During average and dry years, the magnitude of change would be less than in wet years.

Figure 24. Cumulative Effects to Ute Reservoir Storage.

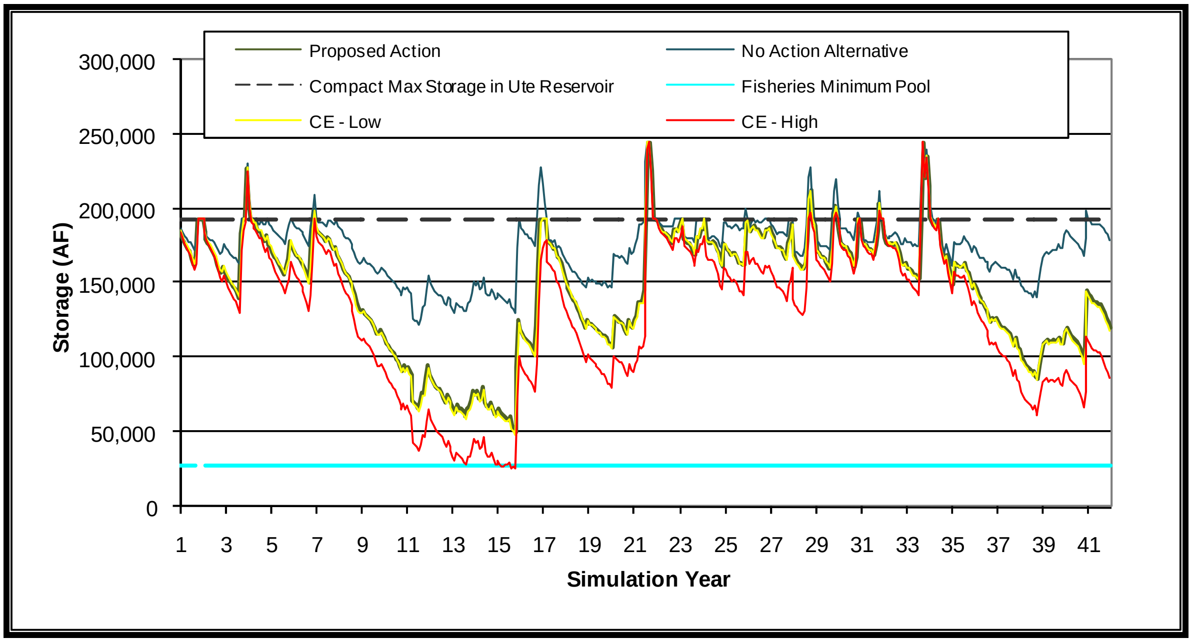
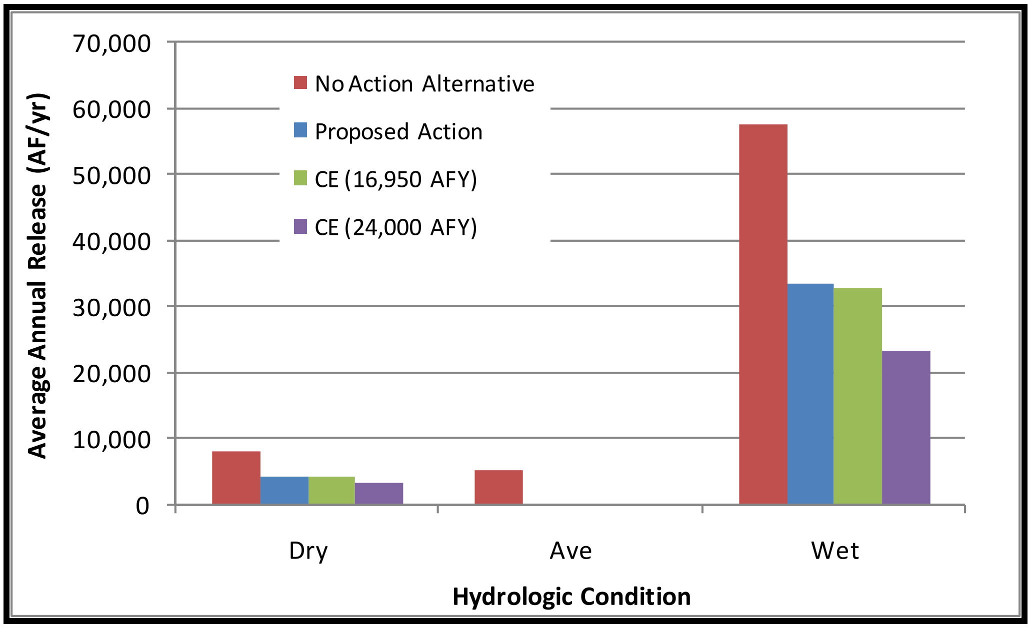


Figure 25. Simulated Ute Reservoir Releases/Spills.



5.1.1.1 Cumulative Effects to Recreation

The cumulative effects hydrologic analysis examined the effects on storage contents, lake elevation, and surface area at Ute Reservoir under both of these future uses (12 Shores at Ute Lake and Quay County Entity Water Use), in addition to the Proposed Action. Table 23 compares projected annual Ute Reservoir visitation under the two cumulative effects scenarios with projected visitation under the No Action Alternative. The cumulative effects low scenario (CE-Low) anticipates the diversion of 500 AFY for 12 Shores at Ute Lake in addition to the diversions anticipated under the Proposed Action (16,450 AFY). The cumulative effects high scenario (CE-High) anticipates the diversion of the total Ute Reservoir allocation for M&I supply (24,000 AFY)

Table 23. Projected Annual Ute Reservoir Visitation under the Cumulative Effects Scenarios Compared to the No Action Alternative (+/- 50%).

	No Action	CE-Low	CE-High
Percent of years with reduced visitation due to low water conditions	22%	51%	68%
Projected average annual visitation	318,000	298,000	286,000
Percent reduction in visitation compared to the No Action Alternative	NA	-6%	-10%
Minimum visitation in driest year	306,000	227,000	194,000

Projected visitation under the CE-Low scenario is only slightly different from projected visitation under the Proposed Action. Under the CE-High scenario, projected use of the full 24,000 AFY of

M&I supply would be expected to have a substantially greater impact on visitation than the Proposed Action alone.

5.1.1.2 Cumulative Effects to Socioeconomics

As under the Proposed Action, the 6 percent reduction in visitation projected under the CE-Low scenario (500 AFY to serve 12 Shores at Ute Lake, in addition to the Proposed Action) would result in a projected $1 million average annual reduction in the output (gross receipts) for the Quay County economy and an annual difference of about 19 jobs throughout Quay County directly and indirectly supported by recreation at Ute Reservoir.

The 10 percent projected reduction in average annual Ute Reservoir visitation under the CE-High scenario (use of the full 24,000 AF of M&I supply from Ute Reservoir), would result in a projected $1.6 million average annual reduction in the output (gross receipts) for the Quay County economy and an annual difference of about 31 jobs throughout Quay County.

As noted earlier, the Project team believes it is reasonable to consider the estimates to have a level of uncertainty of at least +/- 50 percent from the values stated herein.

5.1.1.3 Cumulative Effects on Lakefront and Lakeview Property Values

Based on the cumulative effects hydrologic analysis, lake levels would be between 3,772 and 3,760 feet about 22 percent of the time under the CE-Low scenario (500 AFY for 12 Shores at Ute Lake in addition to the Proposed Action) and about 26 percent of the time under the CE-High scenario (full use of the 24,000-AF M&I allocation from Ute Reservoir). Lake levels would be below 3,760 feet about 8 percent of the time under the CE-Low scenario and about 15 percent of the time under the CE-High scenario.

Applying the valuation assumptions described in Section 4.3.2 to the projected hydrology and anticipated frequency of low lake levels, lower lake levels under the CE-Low scenario would reduce the premium value for lakefront and lakeview locations by an average of about 10 to 20 percent over the 40-year forecast period compared to the No Action Alternative. Lower lake levels under the CE-High scenario would reduce the premium value for lakefront and lakeview locations by an average of about 14 to 28 percent over the 40-year forecast period compared to the No Action Alternative. These declines in the locational premium values correspond to a projected 5 to 10 percent decrease in total value for lakefront homes and 3 to 6 percent decrease in total value for lakeview homes under the CE-Low scenario. Under the CE-High scenario, lower lake levels are projected to lead to a 7 to 14 percent decrease in total value for lakefront homes and a 5 to 9 percent decrease in total value for lakeview homes.

5.1.2 Climate Change

Climate changes have the potential to influence precipitation and weather patterns in the Project Area, and may have cumulative effects with the water resources-related impacts of the Project. Localized effects of climate change are difficult to predict. Federal perspectives (Brekke et al. 2009) and New Mexico information (Enquist and Gori 2008) were considered in this evaluation. Increased variability of precipitation (including more extreme events) and increased average temperature are general global climate change trends. In their New Mexico studies, Enquist and Gori (2008) concluded that recent (20-year) trends have been toward warmer and wetter conditions in eastern New Mexico. It is assumed that these trends are indicative of future climate change consequences in the Project Area.

Given the potential effect to water resources from climate change, this assessment addresses climate change from two perspectives: 1) how the Proposed Action may affect global climate change, and 2) how the Proposed Action may be affected by climate change.

A temporary increase in greenhouse gases would result from construction of the Proposed Action. Greenhouse gas emissions would occur over the time period required for construction, and would potentially contribute to incremental climate change. In the context of climate change, there would be no measurable changes in the composition of the atmosphere or in land use associated with the Proposed Action. Therefore, the Proposed Action would have only minor or immeasurable impacts on climate change.

The Proposed Action may be affected by climate change if a warming climate results because a more rapid melt of the snowpack could occur and, therefore, more runoff could occur in the winter and early spring and less during the later spring and early summer.

Increased annual precipitation in the Project Area would tend to moderate the effects of the Proposed Action on Ute Reservoir levels, and increase the volume and frequency of Ute Reservoir spills and Compact releases under the No Action Alternative and Proposed Action. An increase in precipitation extremes could lead to more frequent high flows in Project Area streams, increasing the potential for erosion and sedimentation. Warmer temperatures would potentially increase evaporation from Ute Reservoir and increase the reservoir water level effects. Warmer temperatures also would increase water demand from agricultural and M&I customers in the Participating Communities, exacerbating Ogallala aquifer ground water declines and accelerating the need for a sustainable water source that would be provided by the Proposed Action.

Chapter 6. Consultation and Coordination

6.1 Scoping/Public Involvement

During the public scoping phase of the Project, Reclamation and NMISC sought input from the public and interested organizations and agencies. EA's have no required formal scoping period. The informal period for this scoping process extended from September 11, 2007 to November 30, 2007. In 2007, three public scoping meetings were held in potentially affected communities in eastern New Mexico. The meeting dates, locations, and times were:

- September 18, Logan Public School, 301 N. 2nd Street, Logan, New Mexico;
- September 19, Clovis-Carver Public Library, 701 N. Main Street, Clovis, New Mexico; and
- September 20, Portales Public Library, 218 South Avenue B, Portales, New Mexico.

6.2 Agencies, Organizations, and Individuals Consulted

Table 24 lists the Pueblo and tribal governments that were consulted in preparing this EA. On September 11, 2007, Reclamation sent a letter inviting tribes to participate in the NEPA process, and provided the Project description. A letter was received from the Navajo Nation on November 30, 2007, stating that the Project Area is outside of the Navajo Aboriginal Lands and will not impact any Navajo traditional cultural properties or historical properties. No other Tribes or Pueblos responded. In January 2008, formal tribal consultation letters were sent out to the Tribes and Pueblos listed in Table 24; no responses have been received.

Table 24. Pueblo and Tribal Governments Consulted.

Pueblo and Tribal Governments	
Pueblo of Isleta	Pueblo of Sandia
Pueblo of Laguna	Jicarilla Apache Nation
Mescalero Apache Tribe	Ysleta del Sur Pueblo
Comanche Indian Tribe	Navajo Nation
Kiowa Tribe of Oklahoma	Pueblo of Zia
Fort Sill Apache Tribe of Oklahoma	Comanche Tribal Business Committee
Pueblo of Acoma	Kiowa Business Committee
Pueblo of Santa Ana	

Table 25 lists the organizations, agencies, and groups that were consulted in preparing this EA. On September 11, 2007, Reclamation sent a letter inviting agencies to participate in the NEPA process, and provided the Project description. A response letter from the NMDGF was received on October 5, 2007 declining the invitation to participate as a cooperating agency in the NEPA process. No other agency response letters were received.

Table 25. Organizations, Agencies, and Groups Consulted.

Agencies, Local Governments, Organizations, and Groups	
U.S. Bureau of Reclamation	Roosevelt County
U.S. Army Corps of Engineers	Cannon Air Force Base
U.S. Fish and Wildlife Service	City of Clovis
U.S. Bureau of Land Management	Town of Elida
New Mexico Department of Game and Fish	Village of Grady
New Mexico Environment Department	Village of Melrose
New Mexico State Historic Preservation Office	City of Portales
New Mexico Interstate Stream Commission	City of Texico
New Mexico Department of Transportation	New Mexico American Water
New Mexico State Parks	Canadian River Municipal Water Authority
Quay County	Curry County

Hardcopy and digital Project newsletters were sent in September 2007, August 2008, and January 2010 to the agencies listed in Table 25, as well as individuals who asked to be added to the mailing list. Agencies were contacted via email and phone throughout the EA drafting process.

NMISC provided a list of 18 private Ute Reservoir boat dock owners. The Project team attempted to contact all 18 owners, and successfully reached eight individuals in August 2009. Boat dock owners were asked about their use of the property (i.e., how long they owned the lakefront property and how many weeks per year they resided at the property), their awareness and understanding of the Project, and concerns of how the Proposed Action could potentially affect them. Permanent residences for boat dock owners—if different from the Ute Reservoir property location—also were documented.

A public meeting was held in Logan, NM on January 19, 2010 following the release of the public Environmental Assessment. The public comment period extended until February 19, 2010. The meeting was advertised in area newspapers and newsletters were released to the project mailing list. The meeting was held at the Logan Public School, 302 N. 2nd Street. In attendance at the public meeting were about 18 members of the public and town officials, in addition to representatives from Reclamation, NMISC, ENMWUA, and ERO. No public comments were received in writing at this meeting. A comment letter was received from the NMDGF on February 18, 2010. The letter provided information and additional analysis of effects to the lake fishery and in the Canadian River. This information and analysis has been added to the EA, and a response letter was provided to NMDGF (see Appendix C). A draft comment letter was received from the USFWS, and comments were addressed through the Section 7 process. The USFWS provided a concurrence letter on December 8, 2010. A comment letter was received from Western Resource Advocates on August 11, 2010, outside of the public comment period. The letter focused on renewable energy sources to power the project. Reclamation has provided a response (see Appendix C), and has incorporated information on ENMWUA's research and intentions regarding the use of wind power resources.

Chapter 7. List of Preparers

Table 26. Preparers of this Environmental Assessment.

Name	Education and Experience	Responsibilities
U.S. Bureau of Reclamation		
Marsha Carra	BS, Anthropology/Geography 19 years	NEPA Project Manager
Gary Dean	BS, Fisheries Biology 23 years	Fisheries and Wildlife Review
Mark Hungerford	BS, Archeology 17 years	Cultural Resource Review; SHPO Coordination
New Mexico Interstate Stream Commission		
Mark Murphy	PhD, Geology 19 years	Hydrology Expertise; Compact Compliance; Water Rights and Use
ERO Resources Corporation		
Aleta Powers	MS, Environmental Sciences 17 years	Project Management; Principal Author
Clint Henke	MS, Environmental Sciences 11 years	Wildlife; Threatened and Endangered and Sensitive Species; Vegetation
Jana Pedersen	Certificate in Geographic Information Systems, BS Geoscience 8 years	Maps and Figures
Sean Larmore	MA, Anthropology 13 years	Cultural Resources
Jennifer McLeland	BA, English 2 years	Technical Editor and Document Production
MWH		
Steve Smith	MS, Civil Engineering 12 years	Water Resources Project Manager
Chip Paulson	MS, Water Resources Engineering 30 years	Water Resources Technical Review

Name	Education and Experience	Responsibilities
BBC		
Doug Jeavons	MA, Economics 19 years	Socioeconomic and Recreation Project Manager
Josh Sidon	PhD, Economics 3 years	Socioeconomic and Recreation Research
GEI		
Lee Bergstedt	MS, Fishery Science 14 years	Aquatic Resources and Fisheries, including the shiner

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CH2M HILL. 2006c. Task Order 1 – Dynamic Simulation Modeling and Hydraulic Optimization of Design Report System. Eastern New Mexico Rural Water System Preliminary Engineering Report, Project Planning Technical Memoranda, Volume 2 of 4. December 2, 2005.

CH2M HILL. 2006d. Task Order 1 – ENMRWA Ute Reservoir, Spring Runoff and Late Summer Water Treatability Testing and Water Treatment Plant Decision Evaluation. Eastern New Mexico Rural Water System Preliminary Engineering Report, Project Planning Technical Memoranda, Volume 2 of 4. December 2, 2005.

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Appendix A. Canadian River Compact and Amended Decree; Project Authorization

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Appendix B. List of EA Technical Reports

Water Resources
Ground Water Affected Environment and Effects Analysis
Water Quality Affected Environment and Effects Analysis
Surface Water Affected Environment
Surface Water Hydrology Effects Analysis

Socioeconomics
Socioeconomics and Recreation Affected Environment and Effects Analysis

Aquatics
Fisheries Affected Environment
Fisheries Effects Analysis

Biology
Species of Concern Affected Environment
General Wildlife Affected Environment
Vegetation Affected Environment

Cultural Resources
Cultural Resources Affected Environment

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Appendix C. Responses to Comments

Draft Environmental Assessment Comment Letter NMDGF Doc. No. 13179

Comment/Response
The Department is concerned with the current health of the fish assemblage in the Canadian River, contrary to the statements in the DEA (p. vi). The Arkansas River shiner is state and federally protected, and several other species are state listed (e.g., Arkansas River speckled chub and suckermouth minnow). Given the federal and state listings and because the range of several of these fishes has diminished in past 75-100 years, it may be more accurate to state the Canadian River now supports a reduced native fish fauna.
The fish assemblage in the Canadian River is diverse and stable, unlike many rivers in the southwest. We have edited the language in the EA to reflect the relative nature of this statement.
The potential impacts to the fishery at Ute Reservoir resulting from the Project are uncertain (p.89). Ute Lake supports a high quality sport fishery and is largely managed as a self-sustaining sport fishery. However, the Department stocks walleye fry annually and largemouth bass occasionally. All other sport fish (e.g., white bass, channel catfish, green sunfish, bluegill, and smallmouth bass) are self sustaining and maintain levels needed for recreational fishing.
We have edited/updated the language in the EA (sections 3.5 and 4.6) to reflect this information.
Most of the self sustaining sport fish species in Ute Lake spawn from late April to mid June, and all use the littoral zone (shoreline) as spawning habitat. Most of the game fish species are "nest builders" and build their nest in the shallow shoreline areas. Significant changes in water levels during this time period and especially during incubation periods could impact spawning success. If the Preferred Alternative is adopted, the Department would be willing to offer input and technical expertise on water take periods to reduce impacts to the sport fishery.
The minimum fisheries pool was established in 1962 between NMISC and the State Game Commission (now the New Mexico Department of Game and Fish) to protect the sport fishery at Ute Reservoir. This Memorandum of Agreement provides an operational constraint on the reservoir pool. In addition, Ute Reservoir is strictly a municipal water supply (no irrigation uses) and is operated within the constraints of the Canadian River Compact—that is, no releases are made from the reservoir unless storage exceeds about 193,240 AF. There are not now, and will not be, large managed releases or inflows of water than result in sudden changes in reservoir storage and shoreline. *Based on correspondence with NMDGF (pers. comm. between Eric Frey and Lee Bergstedt), the current sport fishery in Ute Reservoir is highly managed through stocking and regulations. Walleye are stocked annually or biannually, and do not reproduce in the reservoir at population-sustaining levels and largemouth bass are also stocked periodically to provide recreational opportunities for this species. The white bass population reproduces successfully. Based on these discussions, we assume the white bass is the species of primary interest to NMDGF, but minimizing the effects to channel catfish, green sunfish, bluegill, and smallmouth bass is also important.* *In response to your letter, the EA team examined water demand and associated water level changes in the 7-week period from late April to mid June. Under the existing*

conditions, storage in the reservoir is normally stable during this time period. There is natural variation in storage due to annual differences in precipitation patterns. During drought years when reservoir levels and inflow are both low, fish reproduction may be affected under both the no action and proposed action alternatives, and additional management of the fishery (i.e., stocking) may be necessary. This information will be added to the EA.

The Department offers the following input regarding potential issues:

- How will reduced reservoir levels affect seepage into the Canadian River? The Department is aware that the NMISC is committed to maintaining the existing hydrologic regime to protect downstream Arkansas River Shiner populations, and this commitment is also stated in the Arkansas River Shiner Management Plan. We raise this question because of the potential impact and should this project be implemented, the Department will be pleased to review updates to the management plan in regards to how this issue will be addressed.

Although a "cause and effect" correlation between reservoir level and base flow in the Canadian River has not been established, NMISC has committed to manage and maintain the historical base flow resulting from seepage under Ute Dam (per the Arkansas River Shiner Management Plan for the Canadian River). Participants and signatories to the Plan meet annually to review the best available science relevant to the shiner. No changes to the Plan have been proposed or discussed.

- In Section 3.3.2 Lesser Prairie-Chicken (p.55) it is stated that "There are also known [lesser prairie chicken] leks near the town of Logan, north of the Caprock." At this time, the Department is not aware of any leks near Logan, although the species historically occurred in this area and there has been a confirmed sighting near Logan as well. The most northern known leks in New Mexico occur in Curry County, approximately one mile south of the Caprock.

Thank you for your comment. The information will be edited in the EA.

- In Section 3.5 Wildlife Resources (p.59 -61)
  - The DEA lists northern pike as a fish species occurring in Ute Lake. However, please note that northern pike were once stocked into Ute (1968 and 1969), but likely no longer persist.
  - The DEA refers to the New Mexico Wildlife Protection Act and the New Mexico Wildlife Commission. This should be the New Mexico Wildlife Conservation Act and the New Mexico State Game Commission, respectively.

Thank you for your comment. The information will be edited in the EA.

- During our review, the Department noted that the paper pondshell (*Utterbackia imbecillis*); Arkansas River speckled chub (*Macrhybopsis tetranema*); and suckermouth minnow (*Phenacobius mirabilis*) (all state threatened) which occur either in the lake or downstream, were not addressed. Additionally, if suitable habitat for the Southwestern willow flycatcher (*Empidonax traillii extimus*) (federally endangered) is found within the project area, we suggest this be addressed in the DEA.

Thank you for your comment. Information on the state threatened species will be added to the EA. The project area is outside of the habitat range for the SWWF, per coordination with the USFWS.

Responses to Comments on Eastern New Mexico Rural Water System Draft Environmental Assessment, Western Resources Advocates, letter dated August 11, 2010

Comment
The proposed water supply system should be powered by renewable sources of energy to match the Bureau's stated Purpose and Need of long-term sustainability. Under NEPA, alternatives are responsive to the agency's purpose and need statement. 40CFR 1502.13. The heart of an EIS is its exploration of possible alternatives to the action an agency wishes to pursue. New Mexico ex rel. Richardson v BLM 565 F.3d 683, 708 (10th Cir. 2009) similarly, environmental assessments must contain a brief discussion of alternative to the proposed action 40CFR 1508.9(b). According to the Bureau, the purpose of the proposed action is to provide the participating communities in rural eastern New Mexico a long-term sustainable water supply. Draft EA at 5. Yet, the proposed action itself appears to involve the long-term consumption of non-renewable and non-sustainable resources, particularly in the form of energy to power the water system's pumps and water treatment facilities. See Draft EA at 25-27. The Bureau should incorporate the use of renewable energy into the permanent operation of the proposed water supply system as a common-sense measure to ensure that the proposed action meeting the bureau's stated purpose and need.
Response
Thank you for your review and comment on the January 2010 Eastern New Mexico Rural Water System (ENMRWS) Draft EA. As you are aware, the comment period for this draft document began January 19, 2010 and ended February 19, 2010. Your thoughtful and specific comments, received August 11, 2010, are appreciated. Your letter sections and corresponding response are listed below. *The Eastern New Mexico Water Utility Authority (ENMWUA or Authority) is the project proponent, and supports the construction of a wind energy project, or other potential renewable, in conjunction with the pipeline project. The Authority has invested significant time and money in exploring wind energy options, including three separate studies:* *Wind Energy Feasibility Study (November 2005; updated January 2006)* *Wind Project Site Reconnaissance Study (February 12, 2007)* *Phase II Wind Energy Project Feasibility Study Final Report (March 23, 2007)* *The Authority concluded that a large wind project is financially feasible and well-suited to the Authority and potential partners, but that there are significant constraints. The main constraint to a wind project is the capacity of existing transmission lines near the project area. According to the 2007 Final Report, "interconnections in eastern New Mexico have a comparatively low capability to transmit power…probably capable of transmitting no more than about 50 MW of generation." There is a good deal of interest in upgrading connections and substations in this area, and the Authority is actively keeping up-to-date on developments that would allow a wind power project near the pipeline to become feasible. Because of intermittency issues, it is not possible to tie the*

proposed wind project directly to project facilities as a primary power supply.

The ENMRWS project is a long-term project that is anticipated to require a phased construction period. Throughout each phase of the project, as each section of pipeline and each facility moves from 30% design to final design, there are anticipated to be opportunities to review the status of transmission capacity, and to include solar power components at individual facilities. Solar components would be sited coincident with facilities such as pump stations or the water treatment plant, but have the benefit of being tied directly to the facility rather than to the grid. The Authority intends to consider one or more supplemental solar power plants in the project during subsequent design efforts; however those facilities/pipeline sections are now only at 30% design.

Xcel Energy, the energy provider for the project area, has renewable energy sources and options in the existing system. Wind and solar projects make up some portion of the Xcel energy supply, and by default the project would be powered in part by renewable energy sources. As noted previously, the Authority continues to pursue renewable energy options including possible hydropower opportunities.

Under the proposed Federal action, Reclamation is the intermediary through which funding would be channeled to the ENMWUA to build the water supply to deliver 16,450 acre-feet per year of water from Ute Reservoir to the Participating Communities to meet a portion of current and future water supply needs. The pipeline will be a constructed, owned, operated, and maintained by the ENMWUA

Comment

The Draft EA fails to examine viable conservation alternatives.

At a minimum the Bureau must examine an alternative that powers the proposed water supply system with renewable energy. The existence of a viable but unexamined alternative renders an environmental impact statement inadequate. An agency must look at every reasonable alternative, with the range dictated by the nature and scope of the proposed action, and sufficient to permit a reasoned choice.

The Bureau must examine an alternative that represents the most protective alternative allowable under non-discretionary statutes.

Response

Please refer to the response above. Although transmission constraints currently restrict the feasibility of a wind plant in association with the ENMRWS, the Authority continues to monitor plans for new transmission lines. In additional, solar options for various project facilities are anticipated to be added during final design.

Comment

3. If the proposed action adds to global greenhouse gas emissions, the Bureau must prepare a detailed Environmental Impact Statement.

Response
Long-term energy use by project facilities would replace existing energy demand from existing facilities, and would consolidate a variety of services that currently are completed at a community-by-community basis. Well completion, individual community pumping, individualized water treatment, and other water services would be replaced with a consolidated regional system with efficiencies of scale. There are ongoing discussions surrounding harvesting energy from gravity-fed portions of the pipeline system, and those discussions will continue through the design process. Based on the above discussion, energy demand from the project is not anticipated to increase global greenhouse gas (GHG) emissions. *As noted previously in responses to comments #1 and #2, the ENMWUA is committed to a long-term sustainable water supply system that takes advantage of energy salvage and renewable energy options as much as possible.* *Construction activities associated with implementation of the proposed action would contribute to increased GHG emissions but such emissions would be short-term, ending with the cessation of construction. Any effects of construction – related GHC emissions on climate change would not be discernible at a regional scale, as it is not possible to meaningfully link the GHG emissions of such individual project actions to quantitative effects on regional or global climatic patterns.* *Global greenhouse gas emissions will be minimal as only two finished water booster pump stations are required on the finished water delivery system. As noted previously, these energy requirements would replace existing energy demands from individual Participating Community systems. The two stations will serve all of the communities with one serving most of the system and a second small station serving Elida (primarily for rechlorination). Each finished water booster pump station is currently planned to be equipped with three constant speed horizontal centrifugal pumping units (two duty with one standby). Each raw water pump station is currently planned to be equipped with four vertical turbine pumping units (three duty with one standby).* *EA's are used to determine whether or not a proposed action could have a significant impact which would then require an EIS.*
Comment
4. A FONSI is not justified at this time. In light of the above concerns, a finding of no significant impact is not justified at this time. Unless and until The Bureau adequately addresses these comments and concerns, the Bureau should prepare a full EIS for the Eastern New Mexico Rural Water System.
Response
It is Reclamation policy to release a "draft FONSI" with the draft EA. This ensures the public is aware of our proposed preferred alternative for the federal action.

In addition, the U.S. Fish and Wildlife Service has issued a concurrence letter for the project, agreeing with the finding that the project is not likely to adversely affect threatened and endangered species in the project area. The SHPO and Reclamation have signed a Programmatic Agreement for Section 106 Compliance. Reclamation has coordinated with federal, state and local agencies as well as members of the public, and has found no significant impacts from project implementation.