QUAY COUNTY
Forty Year Water Plan

PREPARED FOR;
QUAY WORKING GROUP

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Prepared by;
Michael L. Barnes, P.E.
Tucumcari, NM 88401

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G	Village of House Well Head Protection Plan and Villages of Logan and San Jon Application for Financial Assistance to Governor Richardson's Water Innovation Fund
H	Arch Hurley Conservancy District Agriculture Conservation Plan
I	Quay County Demographic Information
J	Stream flow Information
K	Water Use Information
L	Temperature and Precipitation Information
M	40 Year Water Plan Resolutions

Acronyms and Abbreviations

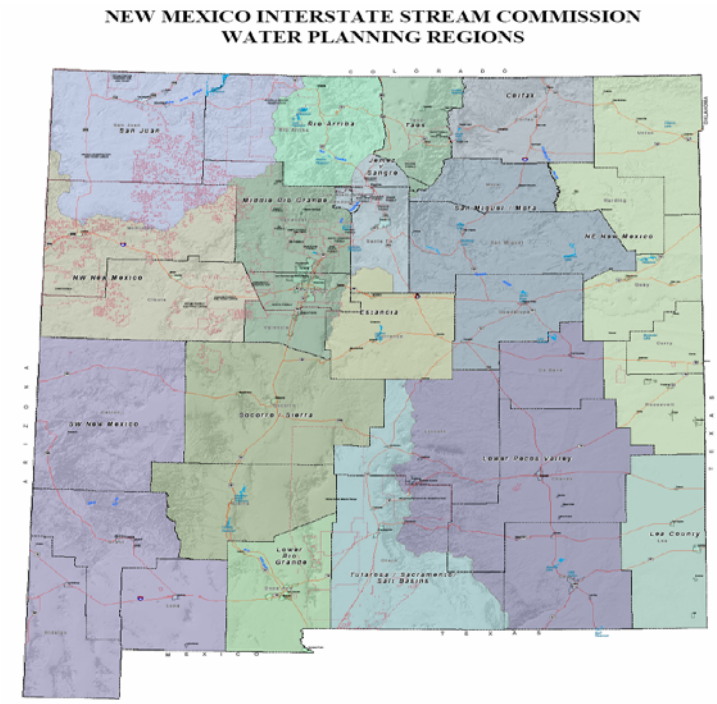
ac-ft	Acre Feet
AHCD	Arch Hurley Conservancy District
ARS	Arkansas River shiner
AWC	available water content
AWT	advanced water treatment
AWWA	American Water Works Association
bgs	below ground surface
cfs	cubic feet per second
cfu/100 mL	colony-forming units per 100 milliliters
cm/s	centimeters per second
ENMRWS	Eastern NM Regional Water System
EPA	U.S. Environmental Protection Agency
ET	evapotranspiration
ft/d	feet per day
ft/ft	foot per foot
FWS	Fish and Wildlife Service
GAC	granular activated carbon
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GWSI	USGS Ground Water Sites Inventory database
ISC	New Mexico Interstate Stream Commission
LMSCP	Lake Meredith Salinity Control Project
MCL	maximum contaminant level
mgd	million gallons per day
mg/L	milligrams per liter
mm	millimeters
mm/d	millimeters per day
msl	mean sea level

ug/L	micrograms per liter
_mhos/cm	micromhos per centimeter
NASS	USDA - National Agricultural Statistics Service
NAWQA	National Water Quality Assessment Program
NMDA	New Mexico Department of Agriculture
NMDH	New Mexico Department of Health
NMDWB	New Mexico Drinking Water Bureau
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NM Const	New Mexico Constitution
NMSA	New Mexico Statutes Annotated
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NCDC	National Climate Data Center
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity units
O&M	operations and maintenance
OSE	New Mexico Office of the State Engineer
PDSI	Palmer Drought Severity Index
QWG	Quay Working Group
RO	Reverse osmosis
RUS	Rural Utilities Services
SAT	soil-aquifer treatment
TDS	total dissolved solids
TMDL	total maximum daily load
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USTs	underground storage tanks
WATERS	OSE Water Administration Technical Engineering Resource System Database
WHPA	Wellhead Protection Area
WRRI	New Mexico Water Resources Research Institute
WWTP	wastewater treatment plant
yd^3	cubic yards

Executive Summary

Quay County, is part of the Northeastern NM Planning Region which is one of 16 planning regions in New Mexico that are in the process of developing a regional water plan. The purpose of regional water planning is to protect New Mexico water resources and to ensure that each region is prepared to meet future water demands. Regional water planning activities are funded through and overseen by the New Mexico Interstate Stream Commission.

Figure ES-1. NM Planning Regions



The New Mexico Interstate Stream Commission's *Regional Water Planning Handbook* (1994) serves as a guideline for regional water planning in New Mexico and is being used as an outline for the Northeastern New Mexico Regional Water Plan. According to the template, a regional water plan must address these questions:

- What is the region's available water supply?
- What is the region's water demand?
- What steps will the region undertake to meet future demand with the available supply?

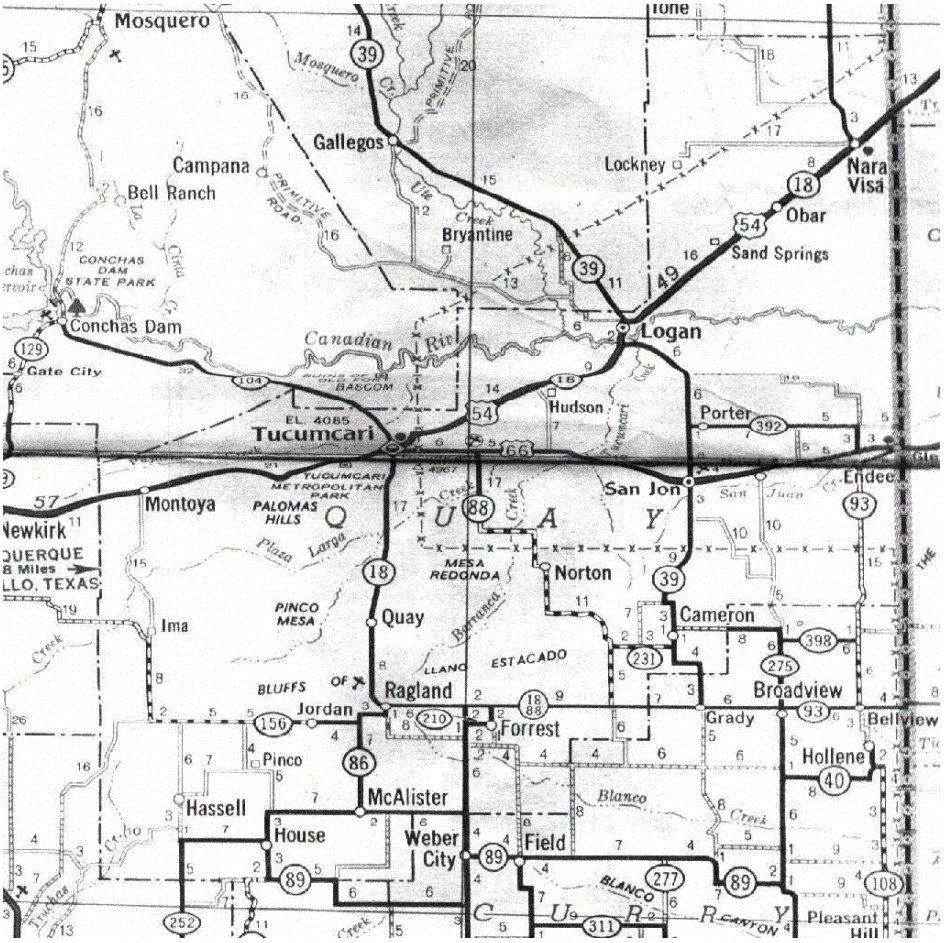
The regional plan includes many diverse areas and counties. The Regional Water Plan was being developed by the Eastern Plains Council of Governments. However, the Communities and Counties of NE New Mexico with the support of ISC have recently decided to fast track the plan by hiring an independent consultant (Daniel B. Stephens and Associates) to complete the plan. The City of Tucumcari, Village of Logan, Village of San Jon, Village of House and Quay County joined together to form the Quay Working Group to address water issues including participation in the Eastern New Mexico Regional Water System. The Quay Working Group decided to prepare a 40 year Water plan for the county pursuant to the requirements of Section 72-1-9, NMSA allowing Municipalities and Counties to prepare water development plans. The

Quay County Plan is intended to complement and be a component of the NE New Mexico Regional Water Plan when completed.

Quay County

Quay County is located in East Central New Mexico between Union and Curry Counties, just east of the Texas border (Figure ES-2). Formerly parts of Guadalupe, San Miguel, and Union Counties, New Mexico; Quay County was created in 1903. The county covers an approximately 2,883-square-mile area. Elevations range from near 3700 feet in the in the eastern region to over 5100 feet at the Caprock. Quay County falls almost entirely within the Canadian River Basin although the Southern part of the County is within the Pecos River Basin. The county includes four incorporated areas: Tucumcari, San Jon, Logan, and House. The population of Quay County is currently about 10,150.

Figure ES-2. Quay County Map (circa 1950)



Most of the land in the county is privately owned. Historically, tourism and agriculture have been the primary industries. Significant livestock grazing and agriculture take place throughout the county and the primary water use in the region is irrigated agriculture.

Water Rights

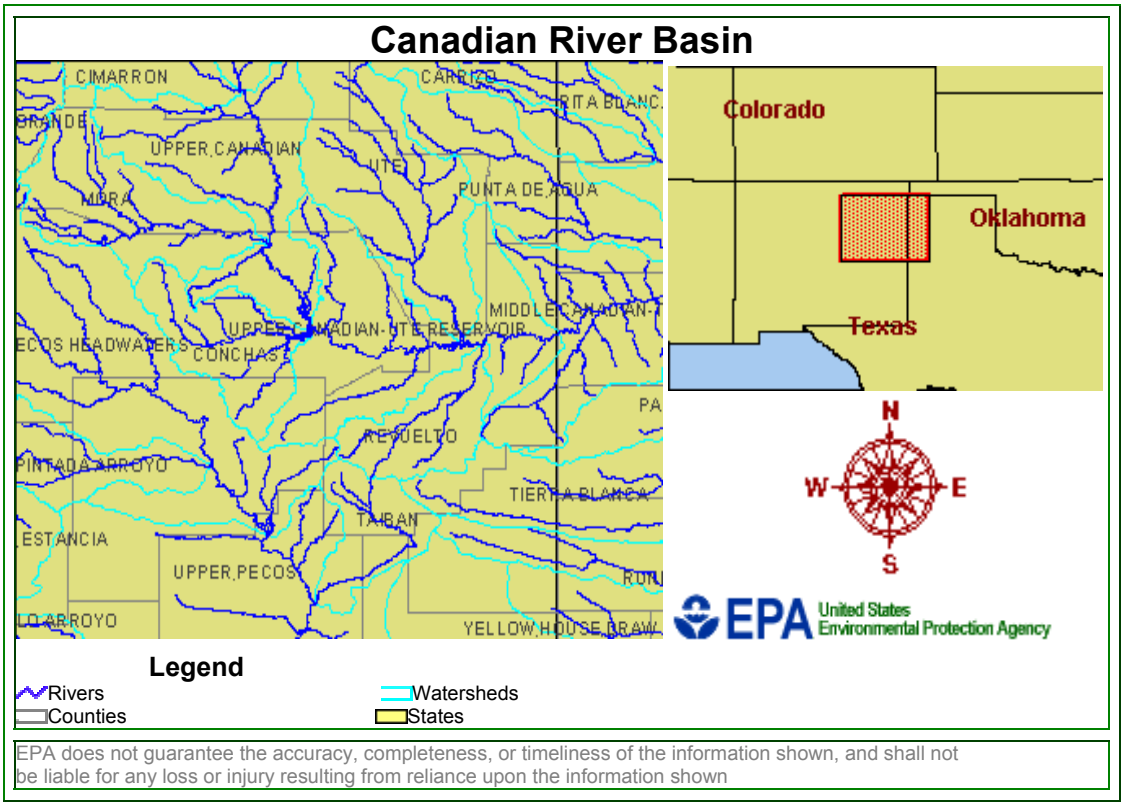
Water rights and legal issues were evaluated to understand constraints on the availability of the water supply. All diversions or withdrawals of surface water and groundwater within declared groundwater basins require the user to have a water right from the State of New Mexico, as administered by the Office of the State Engineer. The adjudicated stream systems in the county are at 0%.

Groundwater rights in New Mexico are administered through the declaration of groundwater basins that require a permit for groundwater withdrawals. Quay County encompasses parts of two declared underground water basins: the Northern three-fourths of the county lies within the Tucumcari Basin; the southwestern portion of the county lies within the Fort Sumner Groundwater Basin. Groundwater in the Southeastern and far Northeastern parts of the county are currently undeclared; therefore a permit is not required to withdraw groundwater in that area.

Water Supply

Quay County currently meets more than 84 percent of its water supply needs with surface water. Most of Quay County is drained by the Canadian River and its tributaries (Figure ES-3), and most of the surface water supply in Quay County is associated with this major drainage. The Canadian River originates in southern Colorado and flows south to the Conchas Reservoir. Canadian River Water from the reservoir flows Southeasterly through the county and into Ute lake Reservoir. Ute Creek is a major Tributary of the Canadian River that merges with the river at the Ute Lake Reservoir. The Southwestern area of the county is drained by the Pecos River which originates in Northern NM and flows southerly through NM to Texas.

Figure ES-3. Canadian River Basin



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The average temperature in Quay County is fairly consistent, ranging between about 55°F and 60°F. Average temperatures have increased slightly over the period of record, mostly due to rising minimum temperatures. Precipitation varies slightly across the county, influenced by location and somewhat by elevation, with average precipitation, including both snowmelt and rainfall, ranging from about 14.5 to 18 inches. Historical climate and stream flow data indicate that the last two years have been significantly drier than normal, with the 2002 water year (which ended on September 30, 2002) being one of the lowest years on record. With the exception of these last two years, however, the past 20 years have been wetter than the overall long-term record. Stream flow records from 3 U.S. Geological Survey monitoring stations (Sanchez on the Canadian River, Canadian just below Ute Lake, and Revuelto near Logan) were evaluated. Total stream flow from these gages represents most of the flow in the region.

The overall surface water quality in Quay County is good, although both Conchas and Ute Reservoirs have been listed as impaired, primarily due to stream bottom deposits, turbidity, and plant nutrients. The presence of these constituents does not necessarily mean the source is unacceptable for irrigation or municipal use. However, the vulnerability of the surface water supply to further degradation indicates that water quality protection should be a priority in Quay County and for the Eastern NM Regional Water Authority (ENMRWA).

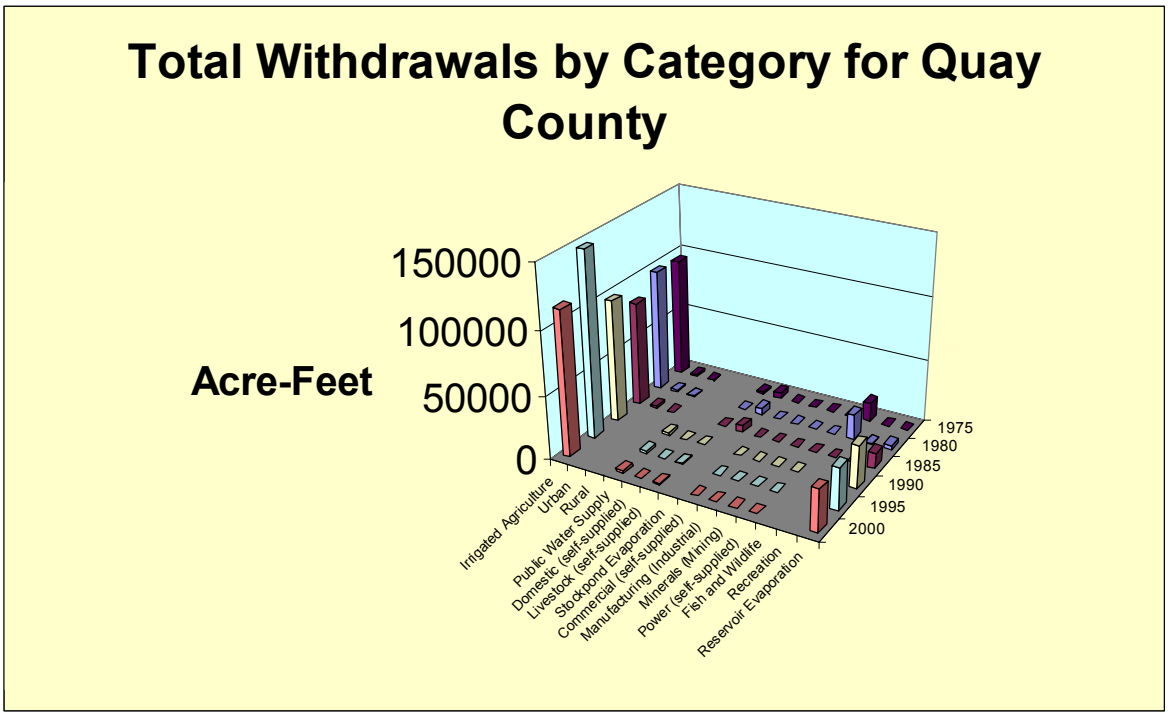
All of the public and domestic water used within the county is supplied from groundwater sources. The largest and most viable sources of groundwater within Quay County are the Entrada Sandstone and the Ogallala Formation. Groundwater quality in many parts of the county is poor, due to naturally high levels of total dissolved solids, and is unusable without treatment. There is a number of leaking underground storage tanks listed within the county. There does not appear to be contamination of groundwater sources used for municipal or domestic uses from the recorded underground storage tank sites. The groundwater sources supplying the incorporated communities within Quay County appear to be adequate to meet the demands of the communities through the life of this plan. However, the communities should initiate hydrological investigations to verify the adequacy of the groundwater to meet future demands.

Water Demand

Present and historical water use was determined primarily based on information from the New Mexico Office of the State Engineer, which tracks water used in New Mexico according to the defined categories of public water supply, self-supplied domestic supply, irrigated agriculture, self-supplied livestock, self-supplied commercial, industrial, mining, and power, and reservoir evaporation. Historically, the largest demand sector in the region is irrigated agriculture (about 80 percent), followed by reservoir evaporation and public water supply (Figure ES-4). The amount of water used in the region is about 150,000 to 185,000 acre-feet per year. The change in demand from year to year is based on available reservoir storage for irrigation, crop requirements and reservoir evaporation, which varies depending on climatic conditions.

Agricultural acreage is expected to remain steady over the 40-year planning period. However, agricultural ground water demands may increase if lower precipitation occurs.

Figure ES-4. Total Withdrawals by Category in Quay County



Alternatives for Meeting Future Demand

To identify alternatives for meeting future demand, the following alternatives were reviewed to determine which alternatives should be reviewed for further analysis:

- Participate in Eastern NM Regional Water System
- Developing County and City ordinances for conservation
- Agricultural water conservation
- Drought planning
- Pursuing water rights transfers or leases to help supply projected demand
- Appropriating and reserving groundwater for the region
- Developing and implementing county-wide septic tank and other water quality control ordinances
- Recycling municipal wastewater for agricultural and recreational use
- Implementing growth management and land use planning
- Providing public outreach and educational activities
- Implement efficiencies in municipal water supply management (e.g., leak detection)
- Remove invasive vegetation
- Xeriscape to conserve municipal water
- Pursue underground storage of available water
- Build additional water storage capacity
- Desalination
- Maintain treatment plant in municipalities and upgrade mains and other infrastructure
- Construct Septic systems to replace septic tanks
- Implement non-point source management projects
- Draft and implement source water and wellhead protection plans for key water supplies
- Develop and enact county/municipal regulations regarding domestic wells

Summary of Recommendations

The communities and Quay County generally do not face a shortage of water for residential and industrial uses based on current and projected demand. Participation in the Eastern New Mexico Water System is an option to supplement/replace current groundwater supplies but is more realistically a vehicle for economic growth and development. The Village of San Jon is currently constructing a water line to tie into the Village of Logan water system which is capable of supplying both communities through the life of the 40 year plan. The communities of Quay County support the ENMRWS for the benefits to neighboring Curry and Roosevelt counties and for potential economic development.

Agricultural users rely generally on surface water and will continue to do so through the life of the plan. Drought conditions have impacted the agricultural sector primarily resulting in the interruption of irrigation water flow through the Arch Hurley Conservancy District due to the minimal storage levels of surface water available in Conchas Reservoir for the 2002, 2003 and 2004 irrigation seasons. Implementation of the Agricultural Conservation Plan is a priority within Quay County.

The communities of Quay County along with the County will be pursuing development of Water Conservation Ordinance(s) which will rely primarily on voluntary conservation and public education efforts. A Drought Task Force will be developed within the county to coordinate local efforts and issues with the Statewide Task Force.

The most pressing need within the county is the maintenance and upgrading of local water and sewer infrastructure to assure that the community systems are operating efficiently, cost effectively and will be able to meet the demands of the community through the 40 year life of the plan. The City of Tucumcari in particular needs to upgrade significant portions of its water and sewer systems since portions of its systems dates back to the 1940s and some even into the 1920s. The City has received funding to begin upgrades of both systems but much more work is necessary. The City of Tucumcari as part of its sewer system upgrade is planning to reuse the reclaimed waste water to irrigate the landscape at the public golf course, cemetery and sporting complex. The Village of Logan is planning to extend sewer service to the westernmost portion of the village along the north shore of Ute Reservoir. The village may consider reuse of the effluent if it is economically viable. The Village of San Jon upon completion of the water line project to Logan will begin to plan for the replacement of Asphaltic Concrete water delivery lines and the upgrade of its waste water treatment plant.

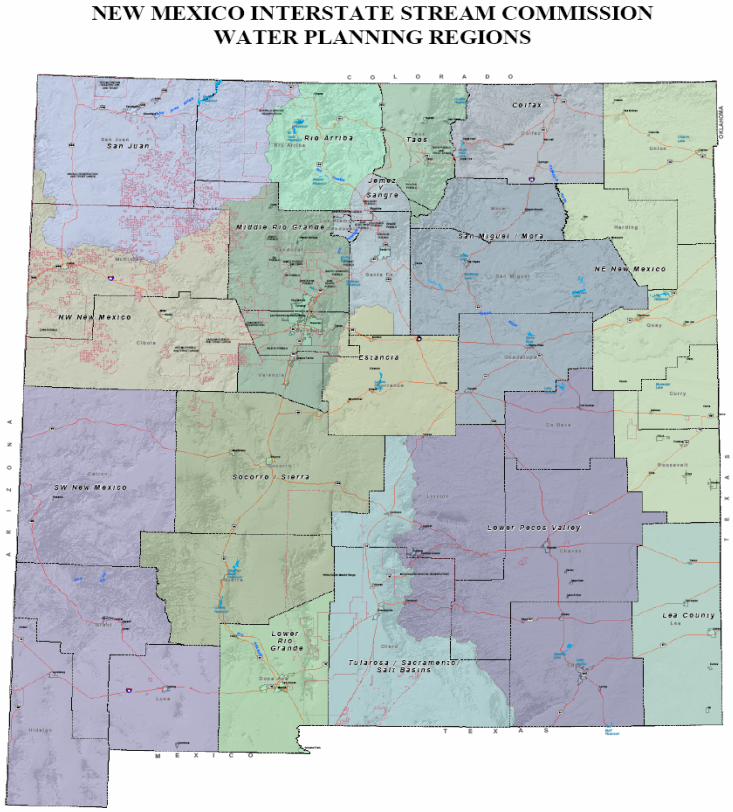
Section 1 - Introduction

1. Introduction

The Northeastern Regional Planning Area (Planning Area), which includes all of Quay County (Figure 1-1), is one of 16 planning regions in the State of New Mexico that are in the process of developing a regional water plan. Regional water planning was initiated in New Mexico in 1987, its primary purpose being to protect New Mexico water resources and to ensure that each region is prepared to meet future water demands. Regional water planning activities are funded through and overseen by the New Mexico Interstate Stream Commission (ISC).

The local Governmental Entities within Quay county joined together to form the Quay Working Group which has decided to develop a Quay County Water Plan as an important component of the Northeastern Regional Water Plan. Section 72-1-9 NMSA; provides that municipalities, counties, state universities, member-owned community water systems, special water users' associations and public utilities supplying water to municipalities or counties shall be allowed to prepare water development plans for planning periods not to exceed 40 years. The work on the plan began in October 2003.

Figure 1-1. Regional Planning Areas



Source: OSE

1.1 Organization of the Quay County Plan

Regional water planning in New Mexico is guided by the template outlined in the ISC Regional Water Planning Handbook (ISC, 1994), which defines the scope and content of regional water plans. According to the template, a regional water plan must address five key questions:

1. What is the water supply available to the region?
2. What is the region's current and projected future demand for water?
3. What are the region's alternatives for using available supplies to meet projected future water demands, including reduction of demand, to the extent needed, to live within available supplies?
4. What are the advantages and disadvantages of each alternative with respect to local values and criteria?
5. What are the best water supply alternatives and how will they be implemented?

1.2 Information Sources

Reference materials pertaining to the water supply and water quality in Quay County were compiled and reviewed. A bibliography of those reference materials is included in Appendix A. Appendix A also includes annotations for the documents that contained information most relevant to the planning region.

Much of the information used in the water supply and water quality assessment was derived from climate and hydrologic records available electronically from state and federal agencies:

- Climatic data was obtained from Western Regional Cooperative Center web site (WRCC 2003).
- Stream flow data through water year 1997 was obtained from the United States Geological Survey (USGS) web site (USGS, 2003).
- Water quality data from the USGS Ground Water Sites Inventory (GWSI) database, as well as data on groundwater wells, was obtained from the USGS Public Information Officer for New Mexico.
- Information on water rights and wells was obtained from the New Mexico Office of the State Engineer (OSE) WATERS Database (NM OSE, 2003).
- Monthly Palmer Drought Severity Index (PDSI) was obtained from the National Climate Data Center web site (NCDC, 2003,2004).
- Information on National Pollutant Discharge Elimination System (NPDES) permits, underground storage tanks (USTs), and total maximum daily loads (TMDLs) was obtained from the New Mexico Environment Department web site (NMED, 2003).
- Information on historical water use was obtained primarily from the OSE.
- Records regarding municipal water use were obtained directly from the municipalities.

Section 2 - Public Participation

The Quay County water planning process attempted to maximize public participation, and all public involvement activities have been documented.

2.1 Public Involvement in the Planning Process

Involvement of all key stakeholders is a critical objective for successful water planning, and a concentrated effort was made to involve local stakeholders from the beginning of the planning effort. Hence, the first step in the Quay regional water planning efforts was to hold a public meeting for the purpose of establishing a steering committee comprised of local stakeholders that would guide the planning efforts. All meetings of the Quay Working Group were advertised and the public was encouraged to attend.

The steering committee is comprised of representatives from each member of the Quay Working Group. Appendix B contains Public Information Materials.

2.2 Public Meetings

Public meetings were held during the second week of February 2004 to obtain input from the public on viable alternatives to be considered within the 40 Year Water Plan to address water demand and planning. The meetings were held at the following locations;

- Quay County – February 9, 2004 at 2:00 pm at County Courthouse in Commission Room
- City of Tucumcari – February 9, 2004 at 5:00pm in City Council Chambers at City Hall
- Village of Logan – February 10, 2004 at 4:30pm at the Logan Civic Center
- Village of San Jon – February 10, 2004 at 7:00pm at Village Hall (Community Center)
- Village of House – February 11, 2004 at 5:00pm at Village Hall

2.3 Communication with the Public

Press releases announcing the public meetings were issued to newspapers (*Quay County Sun*) and to KTNM/KQAY radio in Tucumcari. In addition the Project Manager and representatives of the Quay Working Group provided information to the public during the Feb. 8, 2004 morning show on KTNM.

2.4 Public Welfare

The steering committee developed a regional vision and goals for regional water planning:

- Healthy environment
- Conserve and recycle
- Quality recreation
- Adequate water availability
- Respect for private property rights
- Healthy communities and regional economy
- Protect water rights within the county
- Planned growth
- Regional cooperation
- Resource management
- Provide accurate data
- Educate the public

2.5 Public Review

The Draft 40 Year Water Plan was made available for Public review from 7/15/2004 through 8/15/2004 by viewing at or obtaining a copy from their local Quay Working Group Member office. The draft was also placed on the City of Tucumcari Web Site at;

http://www.cityoftucumcari.com/Quay_Water_Plan.pdf

The public review was advertised in the Quay County Sun. In addition, the notice of Public Review was broadcast by the Local Radio Station numerous times daily throughout the review period. A copy of the notice of Public Hearing is included in Appendix B.

The Draft 40 Year Water Plan was also transmitted to the Office of the State Engineer, Water Planning and Communication Bureau, and to the ENMRWA Project Manager for review and comments.

The Plan was finalized after receiving all comments from all interested parties.

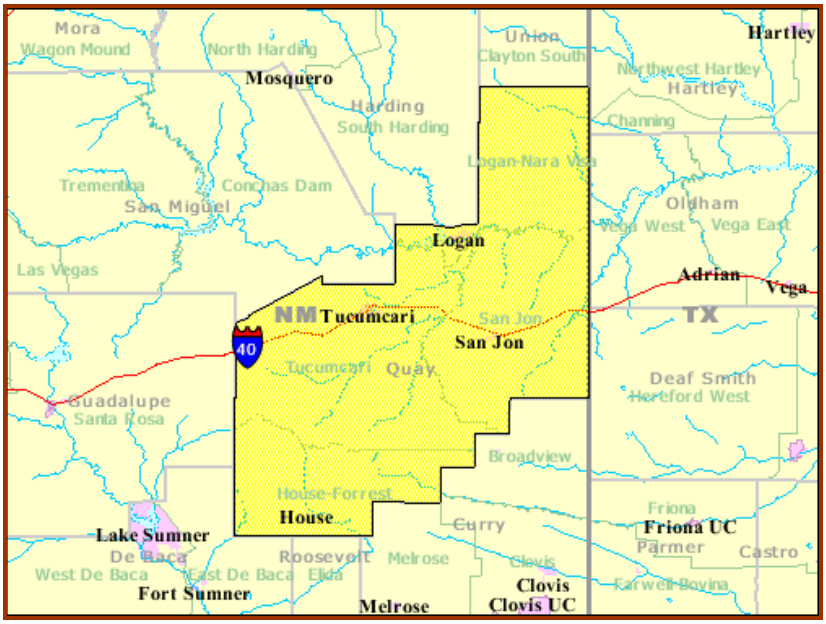
Section 3 - Background

This section provides a general overview of the characteristics of Quay County. Additional detail on the climate, water resources, and demographics of the region is provided in Sections 5 and 6.

3.1 General Description of the County

Quay County is located in eastern New Mexico between Union Counties and Curry Counties and is just east of the Texas border (Figure 3-1). The total area of Quay County is approximately 2883 square miles. Elevations range from over 3600 feet above mean sea level (msl) in the Eastern part of the county to about 4600 feet in the Caprock area as well as in the western and Northern reaches of the county. Piedmont plains, and mesas are common geomorphic features in areas of the County. Vegetation in the county is grasslands of the plains. Natural resources in the area include wind, water and natural gas.

Figure 3-1. Quay County



3.1.1 Climate

The recorded average temperature in Quay County for through 2002 was fairly consistent, ranging between 55° F and 60° F. Average temperatures increased slightly over the period of record. Precipitation also varies across the county, influenced by location and somewhat by elevation. Weather systems may enter the county from the west (Pacific), northeast (Arctic air masses from the plains), and southwest (Gulf of Mexico), and systems from each point of origin bring unique sets of temperatures and moisture to the county. Average precipitation, including both snowmelt and rainfall, ranges from about 14 to 19 inches.

3.1.2 Major Surface and Groundwater Sources

Quay County lies almost entirely within the Canadian River Basin, which is part of the larger Arkansas-White-Red River Basin. Surface water availability varies year to year, depending on the amount of precipitation in the River Basin. Surface Water from the Canadian River Basin is stored at two reservoirs, Conchas Reservoir in San Miguel County and Ute reservoir in Quay County. The occurrence of groundwater in Quay County is dependent upon localized geologic structures, stratigraphy, and geologic formation lithologies. Development of groundwater resources in Quay County has been active to date. Geologic formations with the best potential for groundwater resource development include:

- Alluvial deposits
- Tertiary-age Ogallala Formation
- Cretaceous-age Sandstone Formation
- Jurassic-Age Entrada Sandstone Formation
- Mesozoic and Paleozoic sandstones and siltstones

3.1.3 Demographics, Economic Situation and Land Use

The county includes four incorporated areas: Tucumcari, San Jon, Logan, and House. Tucumcari is the largest municipality, with a population of approximately 6000;
Logan and San Jon, the second and third largest towns, have populations of approximately 1100 and 300, respectively. The total population of Quay County has fluctuated between 10,000 and 14,000 over the last 80 years and is currently about 10150 (New Mexico EDD, 2002).

Table 3-1. Quay County Population by Decades

Date	Population	Population Change	Annual % Change
1900	Null	-	-
1910	14,912	Null	Null
1920	10,444	- 4,468	- 3.5
1930	10,828	384	0.4
1940	12,111	1,283	1.1
1950	13,971	1,860	1.4
1960	12,279	- 1,692	- 1.3
1970	10,903	- 1,376	- 1.2
1980	10,577	- 326	- 0.3
1990	10,823	246	0.2
2000	10,155	- 668	- 0.6

Source: U.S. Bureau of Census

Table 3-2. Quay County Population by Decades

POPULATION OF QUAY COUNTY COMMUNITIES							
	1910	1950	1960	1970	1980	1990	2000
House	N/A	N/A	139	119	117	96	72
Logan	N/A	N/A	320	386	735	804	1094
San Jon	N/A	362	411	308	341	283	306
Tucumcari	2526	8419	8143	7189	6765	6872	5989

Source: U.S. Bureau of Census

However, sizeable seasonal population fluctuations occur throughout the year due to recreation in the Logan/Ute Lake area. In addition, there is a predicted population increase in small communities nationwide due to the attraction of small, safe schools. The Village of House is expecting to double in population in the next few years. Since the last census 9 families have moved to House. Businesses nationwide are transferring a large percent of their employees to telecommuting which gives rural communities a potential for population growth. The third largest wind farm in the world has recently been constructed just west of House in Quay and De Baca counties.. It has the capability of expanding as well as there is a potential to construct additional wind farms in the immediate area. There is a wind farm scheduled to be constructed South of San Jon along the Caprock; construction is pending the reauthorization of Wind Energy Credits by Congress.

Dairies have located in Curry County and inquires concerning locating within Quay County near House have been made due to the availability of water and the semi-arid climate. The House Co-operative anticipating economic development has built a new building to accommodate business expansion and potential growth.

Table 3-3. Visitors to Ute Lake State Park

Visitors to Ute Lake State Park	
Year	Number of Visitors
1993	229,007
1994	205,886
1995	273,283
1996	268,102
1997	215,422
1998	181,859
1999	177,039
2000	273,311
2001	165,000
2002**	401,000
** Traffic Counter added	
Source: Village of Logan	

Table 3-4. Quay County Statistics

Quay County Statistics	
Population (2000 Census)	10,155
Land Area	2,883 Square Miles
Avg. Rainfall	14.5 Inches
Avg.1st Freeze	26-Oct
Avg. Last Freeze	15-Apr
County Seat	Tucumcari
Federal Land	14,535 Acres
State Land	237,714 Acres
Deeded Land	1,591,871 Acres
Inland Water	1,000 Acres
Total Acres within County	1,845,120 Acres

Source; NM Association of Counties

Most of the land in the county is privately owned. Tourism and agriculture have been the primary industries. Significant livestock grazing and agriculture take place throughout the county. Although agriculture is a significant industry in Quay County, the number of people employed is small relative to other industries in the county. The largest employment category in the county is state, local, or federal government, which employs more than 900 county residents. The retail trade industry employs the second largest group of workers; followed by hotel and food service industry, health and social services, Construction, Transportation and Warehousing, Finance and Insurance, and other services (New Mexico EDD, 2002). The utilities industry has the highest average weekly wage followed by Federal Employees, while Accommodations and Food Service employees are among the lowest paid. In 2000, the average per capita income was $17,953 and there were 289 established businesses with more than $68,857,000 in gross receipts from retail trade (New Mexico EDD, 2002).

Table 3-5. Number of Farms

Number of Farms			
Year	1987	1992	1997
In Quay County	589	586	583

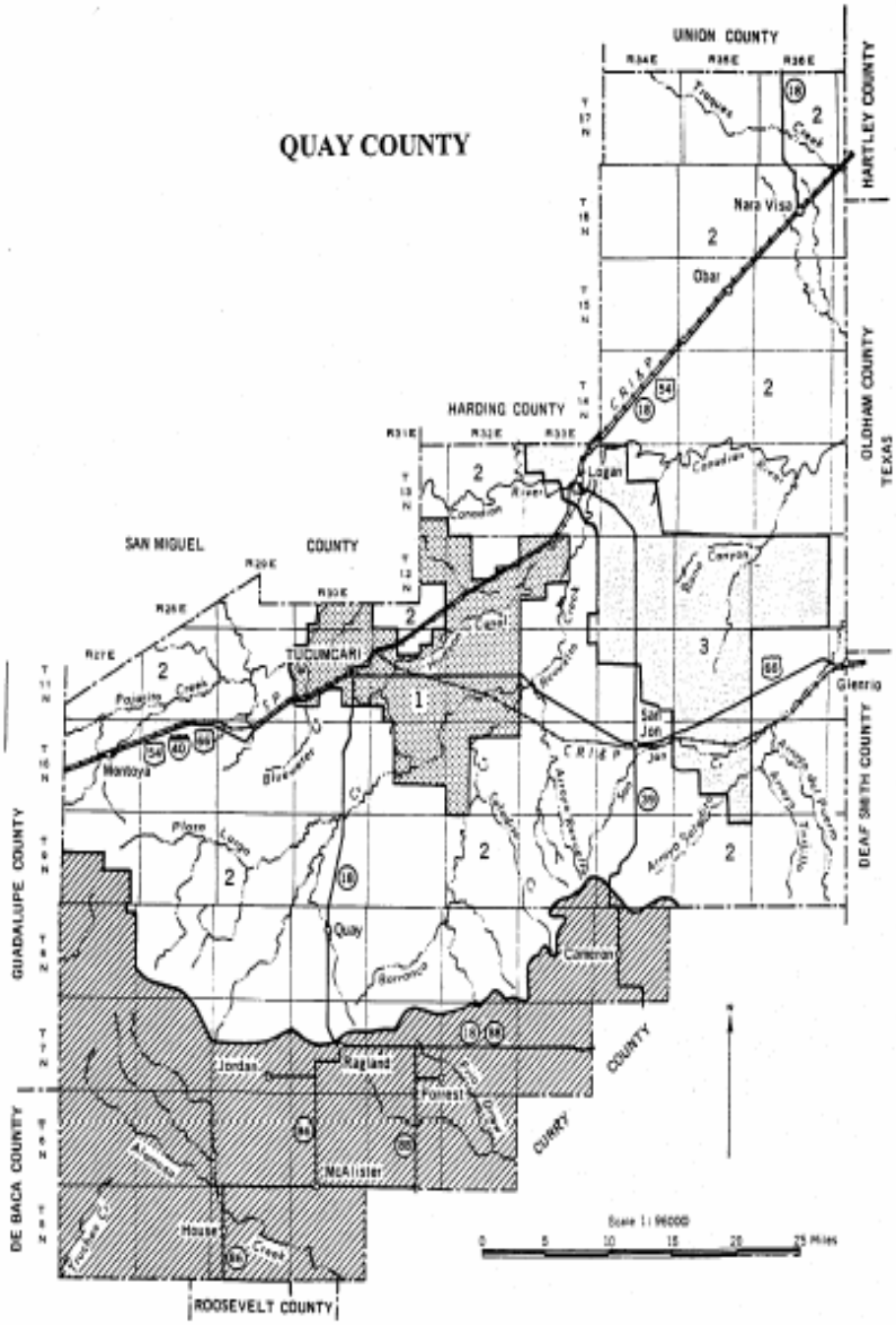
Source; NM Dept. of Agriculture

Table 3-6. Farm Commodities

All Farm Commodities				
1000 Dollars				
County	2001 State Ranking	1992	2002	2001
Quay	11	47,069	48,120	43,281

Source; NM Dept. of Agriculture

Figure 3-2. Land Use



LAND USE:

1. Urban areas and major area of irrigated crop production.
2. Rangeland utilized for livestock grazing.
3. Area of dryland crop production. Some farms in this area were in the first Conservation Reserve Program (CRP) or are in the current CRP.

This map was published in 1974 and reflects land use patterns prior to that date. Land uses in these areas are still similar to the above noted legend.

3.2. Overview of Historical Water Use in the Region

Based on OSE water use categories, irrigated agriculture has historically been and continues to be by far the largest water use in Quay County, accounting for around 80 percent of total withdrawals in 1995 and 2000. The second largest water use is reservoir evaporation, which was 18 percent of total withdrawals in 1995 and 2000. The remaining uses of water in the county are public and domestic water supply (around 1.2 percent of total withdrawals) and livestock, and commercial applications (a combined 0.4 percent of withdrawals). A comparison of water use records for 1975 and 2000 shows little overall change in the proportionate uses of water in the Quay County area (Sorensen, 1977; Wilson, 2002); however, the overall amount of water withdrawn in the county decreased by approximately 33,000 acre-feet, from around 183,317acre-feet in 1975 to approximately 150638 acre-feet in 2000. Section 6 provides a more in-depth discussion of historical and current water use and demand.

3.2.1 Tucumcari Project

Water stored in the Conchas Reservoir, 31 miles northwest of Tucumcari, is conveyed to the Arch Hurley Conservancy District for use to irrigate farmland. The water is conveyed via the Conchas Canal and its branch, the Hudson Canal. The canals deliver the water to the 171-mile distribution system which serves the project.

Table 3-7. Tucumcari Project

Tucumcari Project Arch Hurley Conservancy District	
Storage Dams - Constructed by USACE	1
Canals	110.0 mi
Tunnels	5.8 mi
Siphons	4.2 mi
Laterals	171 mi
Pumping Plants	1
Drains	75 mi
Source: Bureau of Reclamation	

Table 3-8. Conchas Reservoir Storage Available to Tucumcari Project

Water Elevation of Conchas Reservoir Available Water to Arch Hurley Conservancy District	
Mean Sea Level	Acre-Feet
4145	22
4150	14059
4155	24396
4160	39240
4165	56322
4170	75861
4175	98021
4180	123513
4185	152800
4190	186224
4195	224991
4200	269103
4201 (crest)	278559
Source: Arch Hurley Conservancy District	

Section 4 - Legal and Water Rights Issues

In addition to hydrologic constraints, legal issues may also limit the use of the existing and future water supplies. This section identifies potential legal issues.

4.1 Relevant Water Laws

New Mexico water laws affecting Quay County are found in the New Mexico Constitution, New Mexico Statutes Annotated (NMSA), and the case law interpreting and applying the existing law. OSE regulations governing groundwater and surface water and OSE policy for administering various groundwater basins throughout the state also affect water planning and use. New Mexico water law information is provided in Appendix D.

Federal laws that affect water management in Quay County include the Clean Water Act, Safe Drinking Water Act, National Pollution Discharge Elimination System, and the Endangered Species Act. State and federal laws must be reviewed as individual alternatives and projects are implemented to identify project-specific legal issues.

4.2 Federal and State Legal Issues

Federal and state legal and water rights issues musty be identified and addressed as the communities pursue the objectives of the *Quay County Water Plan.* Legal issues relating to water resource management in Quay County are discussed further in this section.

4.2.1 Federal Endangered Species Act: Arkansas Shiner in the Canadian River

There are a number of species listed as Threatened or Endangered that have been identified within Quay County. The Fish and Wildlife Service (FWS) has identified the Canadian River as the habitat for the Arkansas River shiner (ARS) under the federal Endangered Species Act. The habitat of concern is located downstream of Ute Lake in Quay County. In its 1998 federal register notice listing the species as threatened, the FWS stated that “aggregations of Arkansas River shiners in the reach between Ute Reservoir and Lake Meredith are stable and not declining.” The notice states that construction of the Conchas Reservoir in 1938 ultimately led to the extirpation of upstream population (Vol. 63, Fed. Reg. 64791).

The ENMRWA and ISC are studying the impact of the Arkansas River Shiner on the ENMRWS. The study is ongoing but preliminary information indicates that the habitat appears in good condition with plenty of suitable low velocity habitat for the ARS (ISC report to ENMRWA, Feb. 18,2004). The ISC study also suggests that the current leakage from Ute Reservoir of 3-4 cfs will need to be maintained.

During the 40-year planning horizon, it is possible that additional species could be listed. Quay County Managers should continue to monitor endangered and threatened species lists for potential impacts to the county. Potential impacts and mitigative measures must be examined during the planning and design of any projects implemented under this plan.

Table 4-1. QUAY COUNTY NEW MEXICO THREATENED AND ENDANGERED SPECIES LISTING

New Mexico Department of Game and Fish	
Biota Information System of New Mexico (BISON-M)	
Quay County	
September 8, 2004	
'Federal Endangered'	
Category: Birds	
Crane, Whooping	Grus americana
Flycatcher, Willow, SW.	Empidonax traillii extimus
Category: Mammals	
Ferret, Black-footed	Mustela nigripes
'Federal Threatened'	
Category: Birds	
Eagle, Bald	Haliaeetus leucocephalus
Plover, Mountain	Charadrius montanus
Category: Fish	
Shiner, Arkansas River	Notropis girardi (Native pop.)
'Federal Candidate'	
Category: Amphibians	
Toad, Mountain	Bufo boreas complex (NM)
Category: Birds	
Prairie-Chicken, Lesser	Tympanuchus pallidicinctus
Category: Mammals	
Fox, Swift	Vulpes velox velox (NM)
'State of NM Endangered'	
Category: Amphibians	
Toad, Mountain	Bufo boreas complex (NM)
Category: Birds	
Crane, Whooping	Grus americana
Flycatcher, Willow, SW.	Empidonax traillii extimus
Category: Fish	
Shiner, Arkansas River	Notropis girardi (Native pop.)
Category: Molluscs	
Paper Pondshell	Utterbackia imbecillis
'State NM of Threatened'	
Category: Birds	
Sparrow, Baird's	Ammodramus bairdii
Eagle, Bald	Haliaeetus leucocephalus

New Mexico Department of Game and Fish	
Biota Information System of New Mexico (BISON-M)	
Quay County	
September 8, 2004	
Falcon, Peregrine, American	**Falco peregrinus anatum**
Vireo, Gray	**Vireo vicinior**
Category: Fish	
Chub, Speckled, Canadian	**Macrhybopsis aestivalis tetranemus (NM)**
Category: Mammals	
Shrew, Least	**Cryptotis parva**
'Heritage NM: Critically Imperiled in NM '	
Category: Birds	
Ibis, White-faced	**Plegadis chihi**
Duck, Ring-necked	**Aythya collaris**
Eagle, Bald	**Haliaeetus leucocephalus**
Crane, Whooping	**Grus americana**
Phalarope, Wilson's	**Phalaropus tricolor**
Tern, Forster's	**Sterna forsteri**
Swift, Chimney	**Chaetura pelagica**
Category: Crustaceans	
Crayfish, Conchas	**Orconectes deanae**
Category: Fish	
Chub, Speckled, Canadian	**Macrhybopsis aestivalis tetranemus (NM)**
Shiner, Arkansas River	**Notropis girardi (Native pop.)**
Catfish, Channel	**Ictalurus punctatus**
Stickleback, Brook	**Culaea inconstans**
Category: Mammals	
Shrew, Least	**Cryptotis parva**

4.2.2 Canadian River Compact

The Canadian River Compact between the states of New Mexico, Oklahoma and Texas was signed by representatives of the three states and a representative of the United States in December 1950. The compact subsequently was ratified by the respective state legislatures and approved by the Congress in 1952. The Canadian River Compact came about as a result of plans to construct Lake Meredith on the Canadian River near Sanford, Texas. At the time, New Mexico was concerned that construction of the large project could affect the future use of Canadian River water in this state. The Canadian River Compact is essentially a storage allocation compact that limits the amount of conservation storage that can be operated on the Canadian River and its tributaries in New Mexico and Texas, and imposes certain limitations on the operation of such storage facilities. Conservation storage is defined by the compact as: "...that portion of the capacity of reservoirs available for the storage of water for subsequent release for domestic, municipal, irrigation and industrial uses, or any of them, and it excludes any portion of the capacity of reservoirs allocated solely to flood control, power production and sediment control, or any of them." The compact allows New Mexico: 1) free and unrestricted use

of all waters originating in the drainage basin of the Canadian River above Conchas Dam; 2) free and unrestricted use of all waters originating in the drainage basin of the Canadian River in New Mexico below Conchas Dam, provided that the amount of conservation storage in New Mexico available for impounding these waters which originate in the drainage basin of the Canadian River below Conchas Dam shall be limited to 200,000 acre-feet; and 3) the right of New Mexico to provide conservation storage in the drainage basin of the North Canadian River shall be limited to such water that at the time may be unappropriated under the laws of New Mexico and Oklahoma.

The States of Oklahoma and Texas filed a lawsuit alleging that New Mexico was storing more water in Ute Reservoir than allowed by the Compact. The U.S. Supreme Court ruled for Oklahoma and Texas and a stipulated Judgement was granted. The stipulated Judgement allows that no more than 200,000 acre-feet may be impounded below Conchas reservoir. This Judgement limits the storage of Ute Reservoir to the 200,000 acre-feet decreed.

As Quay County is located entirely below Conchas Dam, use of the Canadian River in the county is governed by the Compact and stipulated Judgement. Water management and planning decisions in Quay County must be evaluated for compliance with the Canadian River Compact.

.4.3 Water Quality Standards

Federal and state laws require that water quality meet specific standards. The Federal Clean Water Act and New Mexico surface water quality standards passed under that Act require permits for any discharges to “waters of the United States.” These permits are based on water quality requirements and may place limitations on discharges to surface water. Additionally, the Act requires that water quality in streams and lakes also meet state standards. States are required to report water quality to the U.S. Environmental Protection Agency (EPA) and conduct total maximum daily load (TMDL) activities for surface waters not meeting standards. As a result of a TMDL, discharge permit limitations can be made stricter, and efforts to improve the watershed implemented.

State law controls discharges to groundwater through the New Mexico Water Quality Act. One goal of the Act is to prevent discharges to groundwater that would impair water quality. The NMED requires groundwater discharge plans for almost all types of activities that can impact groundwater quality. The Safe Drinking Water Act sets the standards for water that is used as a drinking water supply. It also creates programs, such as wellhead protection and sole source aquifer designation, to protect drinking water aquifers.

4.4 Water Rights Administration and Relevant Lawsuits in Quay County

Assessment of the available water supply includes not only determining what groundwater and surface water resources exist in the planning area, but also ascertaining how much of that water has been appropriated to other users, making it unavailable for use by the planning region.

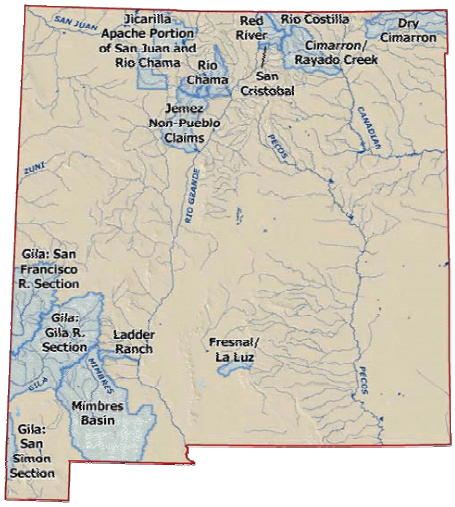
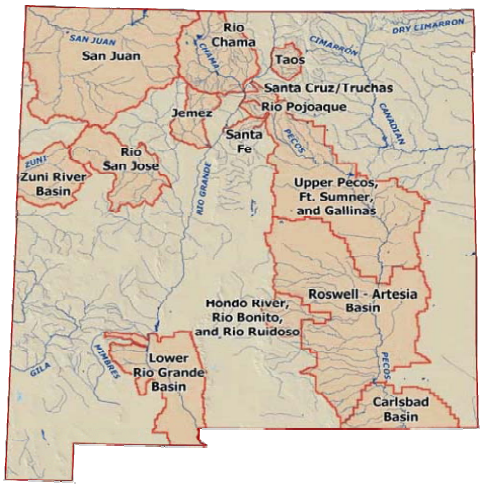
The OSE has the authority to delineate groundwater basins that require a permit for groundwater withdrawals, referred to as “declared underground water basins.” In order to withdraw water from these declared basins, a user must have applied water to beneficial use prior to the basin declaration, thus creating a pre-basin water right, or the user must obtain a water permit from the OSE that specifies (1) how much water a user can withdraw within any given year, (2) the location and type of well that will be used to withdraw the water, and (3) the use to which the water will be put. Diversion of water from New Mexico’s surface waters also

requires obtaining a water right from the OSE. Surface water appropriations follow the same standards as groundwater rights.

4.4.1 Surface Water Adjudications and Administration

Water rights adjudication is a lawsuit that determines the right to use the waters of any stream system (NMSA 72-4-17). New Mexico courts have interpreted the intent of the legislature in creating this provision by stating "it was evident design of the legislature by this act to have adjudicated and settled by judicial decree, all water rights in state and to have determined the amount of water to which each water user was entitled so that the distribution of water could be facilitated and unappropriated water be determined in order that it might be utilized" *(Snow v. Abalos,* 18 NM 681, 1914). Adjudications are beneficial for regional water planning because they clearly establish the priority dates, water duty (the amount of water allowed to be diverted for each acre of land irrigated), and amounts of water rights available in the planning area.

In Quay County, the major streams have not been adjudicated, which means that stream-related water rights in the region have not been finalized and decreed. Streams that are not yet adjudicated can be considered fully appropriated. Thus even though the Canadian River in Quay County has not been adjudicated, it is considered fully appropriated.

Figure 4-1. Completed Adjudications	**Figure 4-2. Active Adjudications**
	

4.4.2 Groundwater Administration

The New Mexico Water Code was not made applicable to groundwater until 1931 and then only in declared groundwater basins. After an underground basin is declared by the State Engineer, no lawful appropriation can occur without a State Engineer issued permit. Appropriations and transfers of water rights within an area not within a declared groundwater basin are accomplished without State Engineer involvement.

The Water Code provides with the OSE the authority to delineate groundwater basins that require a permit for groundwater withdrawals, referred to as "declared underground water basins." There are two declared groundwater basins in Quay County. They are the Tucumcari Basin and the Fort Sumner Basin.

Figure 4-3. Declared Groundwater Basins

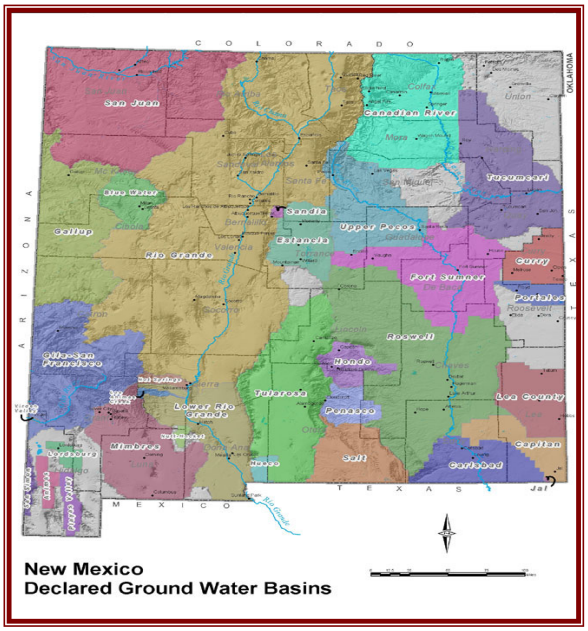
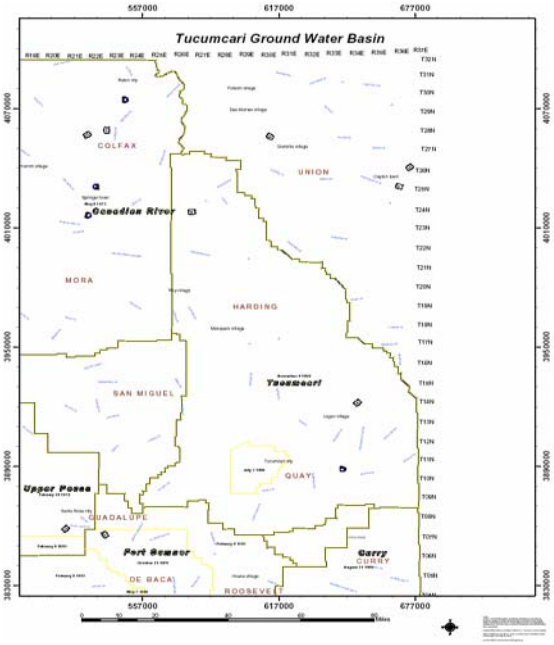


Figure 4-4. Tucumcari Basin



Source: OSE

Groundwater users, other than those with private domestic wells, are listed in Table 4-2. This list was derived from the OSE WATERS database.

Table 4-2. Water Rights Information for Non-Domestic Wells

WELL / SURFACE DATA REPORT 11/04/2003				
DB File No.	**Use**	**Diversion**	**Owner**	**Well Number**
FS 00595	IRR	5760	LYONS RANCH	FS 00594
				FS 00595
FS 00613	IRR	300	JAMES F. MORROW	FS 00613
FS 00614	IRR	336	LOUIS W. MCDANIEL	FS 00614
FS 00615	IRR	159	G. B. IRWIN	FS 00615
FS 00616	IRR	120	DAVID M. FRAIZER	FS 00616
FS 00617	IRR	140	GLENN BASS	FS 00617

WELL / SURFACE DATA REPORT 11/04/2003				
DB File No.	Use	Diversion	Owner	Well Number
				FS 00618
FS 00618	IRR	140	GLENN BASS	FS 00618
FS 00619	IRR	120	ASA G. PASCHALL	FS 00619
FS 00835	IRR	1000	SHOEMAKER RANCH	FS 00835
				FS 00836
FS 00836	IRR	0	SHOEMAKER RANCH	FS 00836
FS 00837	IRR	600	SHOEMAKER RANCH	FS 00837
FS 00888	IRR	600	GLEN R. FRANKLIN	FS 00888
FS 00896	IRR	300	BURK RANCH INC	FS 00896
FS 00897	IRR	100	BRUCE RUNYAN	FS 00897
FS 00899	IRR	3	BRUCE RUNYAN	FS 00899
FS 00900	IRR	5	BRUCE RUNYAN	FS 00900
FS 00901	IRR	40	BRUCE RUNYAN	FS 00901
FS 00903	IRR	100	BRUCE RUNYAN	FS 00903
FS 00905	IRR	50	BRUCE RUNYAN	FS 00905
FS 00907	IRR	20	BRUCE RUNYAN	FS 00907
FS 00910	IRR	20	BRUCE RUNYAN	FS 00910
FS 00914	IRR	25	BRUCE RUNYAN	FS 00914
FS 00915	IRR	50	BRUCE RUNYAN	FS 00915
FS 00916	IRR	50	BRUCE RUNYAN	FS 00916
FS 00917	IRR	50	BRUCE RUNYAN	FS 00917
FS 00922	IRR	30	BRUCE RUNYAN	FS 00922
FS 00924	IRR	50	BRUCE RUNYAN	FS 00924
FS 00928	IRR	40	BRUCE RUNYAN	FS 00928
FS 00972	IRR	160	CALVIN E. AND BEVERLY K. MORGAN	FS 00972
FS 00989	IRR	350	GENE ROBBERSON	FS 00989
				FS 00990

WELL / SURFACE DATA REPORT
11/04/2003

DB File No.	Use	Diversion	Owner	Well Number
				FS 00991
				FS 00992
FS 00990	IRR	0	GENE ROBBERSON	FS 00990
FS 00991	IRR	0	GENE ROBBERSON	FS 00991
FS 00992	IRR	0	GENE ROBBERSON	FS 00992
FS 01009	IRR	720	MAURICE RUNYAN	FS 01009
				FS 01009 S
				FS 01009 S-2
				FS 01009 S-3
				FS 01009 S-4
				FS 01009 S-5
FS 01010	IRR	450	MAURICE RUNYAN	FS 01010
				FS 01010 S
				FS 01010 S 2
				FS 01010 S 3
				FS 01010 S 4
FS 01032	IRR	2160	TERRY LEWIS	FS 01032
FS 01038	IRR	480	TERRY LEWIS	FS 01038
FS 01094	IRR	264	FOURELL INC.	FS 01094
				FS 01094 S
				FS 01094 S-2
FS 01095	IRR	264	FOURELL INC.	FS 01095
				FS 01095 S
				FS 01095 S-2
FS 01096	IRR	308	FOURELL INC.	FS 01096
				FS 01096 S
FS 01097	IRR	374	FOURELL INC.	FS 01097
				FS 01097 S
				FS 01097 S-2

WELL / SURFACE DATA REPORT
11/04/2003

DB File No.	Use	Diversion	Owner	Well Number
				FS 01097 S-3
				FS 01097 S-4
FS 01098	IRR	264	FOURELL INC.	FS 01098
				FS 01098 S
				FS 01098 S-2
FS 01117	IRR	40	DONNIE R. OR ELVERNA R. SPARKS	FS 01117
FS 01129	MUN	250	VILLAGE OF HOUSE	FS 01129
FS 01250	IRR	60	AKIN & AKIN, INC	FS 01250
FS 01251	IRR	120	AKIN & AKIN, INC.	FS 01251
FS 01252	IRR	15	AKIN & AKIN, INC.	FS 01252
TU 00005	EXP	0	PARKER LAND COMPANY	TU 00005EXPL
TU 00006	EXP	3	PARKER LAND COMPANY	TU 00006EXPL
TU 00016	MUN	155	CITY OF TUCUMCARI	TU 00016
TU 00017	MUN	160	CITY OF TUCUMCARI	TU 00017
TU 00018	MUN	291	CITY OF TUCUMCARI	TU 00018
TU 00019	MUN	291	CITY OF TUCUMCARI	TU 00019
TU 00020	MUN	402	CITY OF TUCUMCARI	TU 00020
TU 00021	MUN	300	CITY OF TUCUMCARI	TU 00021
TU 00023	MUN	155	CITY OF TUCUMCARI	TU 00023
TU 00024	MUN	300	CITY OF TUCUMCARI	TU 00024
TU 00025	MUN	300	CITY OF TUCUMCARI	TU 00025
TU 00026	MUN	436	CITY OF TUCUMCARI	TU 00026

WELL / SURFACE DATA REPORT
11/04/2003

DB File No.	Use	Diversion	Owner	Well Number
TU 00027	MUN	155	CITY OF TUCUMCARI	TU 00027
TU 00028	MUN	155	CITY OF TUCUMCARI	TU 00028
TU 00029	MUN	145	CITY OF TUCUMCARI	TU 00029
TU 00030	MUN	194	CITY OF TUCUMCARI	TU 00030
TU 00031	MUN	97	CITY OF TUCUMCARI	TU 00031
TU 00032	MUN	300	CITY OF TUCUMCARI	TU 00032
TU 00033	MUN	194	CITY OF TUCUMCARI	TU 00033
TU 00034	MUN	145	CITY OF TUCUMCARI	TU 00034
TU 00035	MUN	125	CITY OF TUCUMCARI	TU 00035
TU 00048	EXP	0	INC. PARKER LAND COMPA	TU 00048
TU 00052	IRR	0	JOHN O. AND RUTH MATTI	TU 00052
TU 00084	EXP	3	CIRCLE K CORPORATION	TU 00084
TU 00111	IRR	60	ALVIN LEM CHESHER	TU 00111
TU 00175	POL	725	U.S. DEPT. OF INTERIOR	TU 00175
TU 00176	POL	725	U.S. DEPT. OF INTERIOR	TU 00176
TU 00177	POL	725	U.S. DEPT. OF INTERIOR	TU 00177
TU 00178	POL	725	U.S. DEPT. OF INTERIOR	TU 00178
TU 00179	POL	725	U.S. DEPT. OF INTERIOR	TU 00179
TU 00180	POL	725	U.S. DEPT. OF INTERIOR	TU 00180

WELL / SURFACE DATA REPORT
11/04/2003

DB File No.	Use	Diversion	Owner	Well Number
TU 00181	POL	725	U.S. DEPT. OF INTERIOR	TU 00181
TU 00182	POL	725	U.S. DEPT. OF INTERIOR	TU 00182
TU 00183	POL	725	U.S. DEPT. OF INTERIOR	TU 00183
TU 00184	POL	725	U.S. DEPT. OF INTERIOR	TU 00184
TU 00185	POL	725	U.S. DEPT. OF INTERIOR	TU 00185
TU 00191	IRR	45	L. C. STRAWN	TU 00191
TU 00259	IRR	13.6	MAURICE MARCHBANKS	TU 00259
TU 00260	IRR	240	RICKY PURCELL	TU 00260
TU 00261	IRR	240	RICKY PURCELL	TU 00261
TU 00262	IRR	240	RICKY PURCELL	TU 00262
TU 00263	IRR	1.3	MAURICE MARCHBANKS	TU 00263
TU 00276	IRR	300	RINESTINE RANCH, INC.	TU 00276
TU 00279	POL	127.52	BUREAU OF RECLAMATION	TU 00279
TU 00280	POL	140.325	BUREAU OF RECLAMATION	TU 00280
TU 00284	POL	169.48	BUREAU OF RECLAMATION	TU 00284
TU 00287	POL	766.7	BUREAU OF RECLAMATION	TU 00287
TU 00290	IRR	3	BOBBY D. WHITE	TU 00290
TU 00319	IRR	0	AUBREY L FLEMING	TU 00319
TU 00320	IRR	3.025	WILLIAM J BULLOCK	TU 00320
TU 00321	AGR	240	JAMES E RINESTINE	TU 00321
TU 00322	IRR	3	WILLIAM A UPTON	TU 00322
TU 00323	IRR	3	G B IRWIN	TU 00323

WELL / SURFACE DATA REPORT
11/04/2003

DB File No.	Use	Diversion	Owner	Well Number
TU 00324	IRR	3	DAVID M FRAZIER	TU 00324
TU 00338	IRR	240	JAMES RINESTINE	TU 00338
TU 00377	IRR	0	GLENN BASS	TU 00377
TU 00378	IRR	0	GLENN BASS	TU 00378
TU 00434	IRR	3	LEONARD WALLIN	TU 00434
TU 00546	IRR	0	R N ROGERS	TU 00546
TU 00723	IRR	0	BOBBY D. WHITE	TU 00723
TU 00725	IRR	120	BOBBY D. WHITE	TU 00725
TU 00961	IRR	4	ROBERT QUAY	TU 00961
TU 00994	IRR	0	LAWRENCE OR PATSY SZAL	TU 00994
TU 01003	IRR	21.54	O.O. AND MILDRED, JR O	TU 01003
TU 01179	IRR	223	VILLAGE LOGAN	TU 01179
TU 01209	MUN	17.7	VILLAGE OF SAN JON	TU 01209
TU 01210	MDW	0	VILLAGE OF SAN JON	TU 01210
TU 01211	MUN	17.7	VILLAGE OF SAN JON	TU 01211
TU 01212	MUN	16.1	VILLAGE OF SAN JON	TU 01212
TU 01213	MUN	22.6	VILLAGE OF SAN JON	TU 01213
TU 01214	MUN	35.5	VILLAGE OF SAN JON	TU 01214
TU 01215	MUN	9.2	VILLAGE OF SAN JON	TU 01215
TU 01216	MUN	8	VILLAGE OF SAN JON	TU 01216
TU 01217	MUN	17.7	VILLAGE OF SAN JON	TU 01217
TU 01257	IRR	32	CITY OF TUCUMCARI	TU 01257

WELL / SURFACE DATA REPORT 11/04/2003				
DB File No.	Use	Diversion	Owner	Well Number
TU 01271	IRR	150	DANIEL L RUBENTHALER	TU 01271
TU 01272	IRR	150	DANIEL L RUBENTHALER	TU 01272
TU 01273	IRR	150	DANIEL L RUBENTHALER	TU 01273
TU 01274	IRR	150	DANIEL L RUBENTHALER	TU 01274
TU 01275	IRR	13	DANIEL L RUBENTHALER	TU 01275
TU 01276	IRR	150	DANIEL L RUBENTHALER	TU 01276
TU 01277	IRR	150	DANIEL L RUBENTHALER	TU 01277
TU 01303	IRR	500	JOHN R WINTER	TU 01303
TU 01304	IRR	900	JOHN R WINTER	TU 01304
TU 01325	MUN	125	VILLAGE OF LOGAN	TU 01325
TU 01326	MUN	29.8	VILLAGE OF LOGAN	TU 01326
TU 01327	MUN	65	VILLAGE OF LOGAN	TU 01327
TU 01328	MUN	46	VILLAGE OF LOGAN	TU 01328
TU 01330	MUN	250	VILLAGE OF LOGAN	TU 01330
TU 01331	MUN	150	VILLAGE OF LOGAN	TU 01331

Source: OSE WATERS DATABASE

Domestic well permits have been granted automatically by the OSE under NMSA 72-12-1 and thus have not been subject either to evaluation of potential impairment or to protest or permit conditions. Applicants simply file a permit with the OSE and are then entitled by statute to use up to 3 ac-ft/yr.

The NM legislature considered in the 2004 Regular Session proposed legislation, HB 196 and SB 89, which would provide the OSE with the power to regulate Domestic Wells within designated critical management areas. SB 89 was in conference committee between the House and Senate at the close of the regular session. The conference report was accepted but the bill was not passed by both the Senate and the House by the close of the session.

Passage of this legislation would have changed the automatic approval of Domestic Well Permits and is likely to be reintroduced during the next regular session of the Legislature.

4.5 Summary and Conclusion

Federal and state legal and water rights issues should not prevent the Quay Working Group from pursuing the alternatives and objectives of the Quay County Forty (40) Year Water Plan. As individual alternatives develop into projects and initiatives requiring feasibility studies, legal issues such as water right transfers and state and federal permit requirements must be addressed as part of the feasibility evaluation.

Conclusions and recommendations regarding particular issues with potential legal ramifications are:

- With regard to the Arkansas River shiner, federal action should be monitored since it is likely to have a direct impact on Quay County and the ENMRWS.
- The Canadian Compact places restrictions on use of water in Quay County and water from Ute Reservoir is fully subject to the storage requirements of the compact and subsequent Stipulated Judgement. This directly affects the communities within Quay County who have water reserved in Ute Lake for municipal and industrial uses as well as the ENMRWA.

Section 5 - Water Resources

5. Water Resources

This section provides an overview of the water supply in the region, including both surface and groundwater supplies (Sections 5.1 and 5.2) and water quality (Section 5.3). Summary information on the water supply of the region relative to the demands for water use is provided in Section 6.

5.1 Surface Water Supply

Surface water originates primarily in the mountains north and west of the county and flows generally east and south via the Canadian River to the Conchas Reservoir in San Miguel County or via Ute Creek to Ute Reservoir in Quay county.

Table 5-1. Conchas Reservoir Storage

CONCHAS RESERVOIR				
DRAINAGE AREA = 7,409 SQ MI				
	VOLUME IN AC-FT	AREA IN ACRES	ELEV IN FEET	FLOW IN OUTLET
TOP OF DAM	721,939	17,580	4,235	0
MAXIMUM POOL	671,179	16,033	4,228.60	9,800
TOP OF FLOOD CONTROL AND EMERGENCY SPILLWAY CREST	513903	13,626	4218	9910
TOP OF IRRIGATION AND SERVICE SPILLWAY CREST	315,735	9,615	4,201	9,800
TOP OF PERMANENT POOL AND BELOW = DEAD STORAGE	61,532	2,694	4,155	8200
ZERO STORAGE	0	0	4,071	0
CONDUIT INVERT	2	0	4,060	0

Source: US Army Corps Of Engineers

Water flows from the Conchas Reservoir through the northern area of the county and to Ute Lake Reservoir. Ute Creek Drainage Basin flows into the Canadian River at the Ute Lake Reservoir.

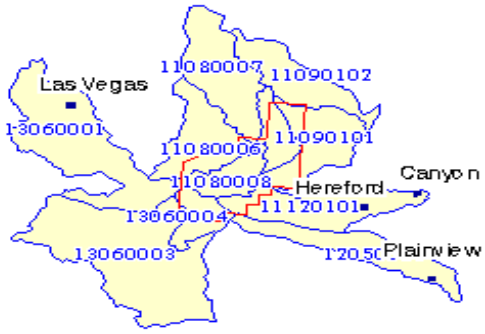
Table 5-2. Ute Reservoir Storage

UTE RESERVOIR NEAR LOGAN		
DRAINAGE AREA ≈ 11,140 SQ MI		
	VOLUME IN AC-FT	ELEV IN FEET
SPILLWAY CREST	244,957	3788.86
MAXIMUM POOL	200,000	3783.3
ENMRWA PROPOSED MINIMUM POOL	≈ 109,000	3765
ORIGINAL SPILLWAY	≈ 85,000	3760
CURRENT MINIMUM POOL	≈ 35,000	3741.6
INACTIVE POOL	8941	≈ 3725

Source: OSE

Major surface drainages and watersheds in Quay County are shown in Figure 5-1.

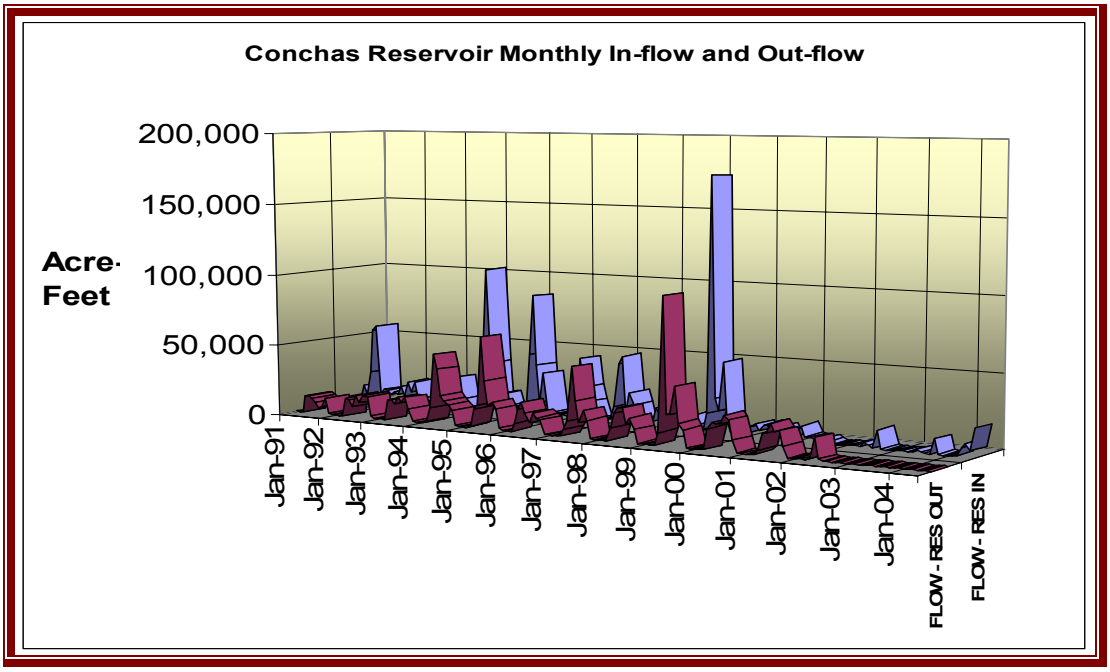
Figure 5-1. Quay County Watersheds with Quay County outlined in Red



11080006 Upper Canadian-Ute Reservoir; state(s): NM, TX
11080007 Ute; state(s): NM
11080008 Revuelto; state(s): NM
11090101 Middle Canadian-Trujillo; state(s): NM, TX
11090102 Punta De Agua; state(s): NM, TX
11120101 Tierra Blanca; state(s): NM, TX
12050005 Running Water Draw; state(s): NM, TX
13060001 Pecos Headwaters; state(s): NM
13060003 Upper Pecos; state(s): NM
13060004 Taiban; state(s): NM

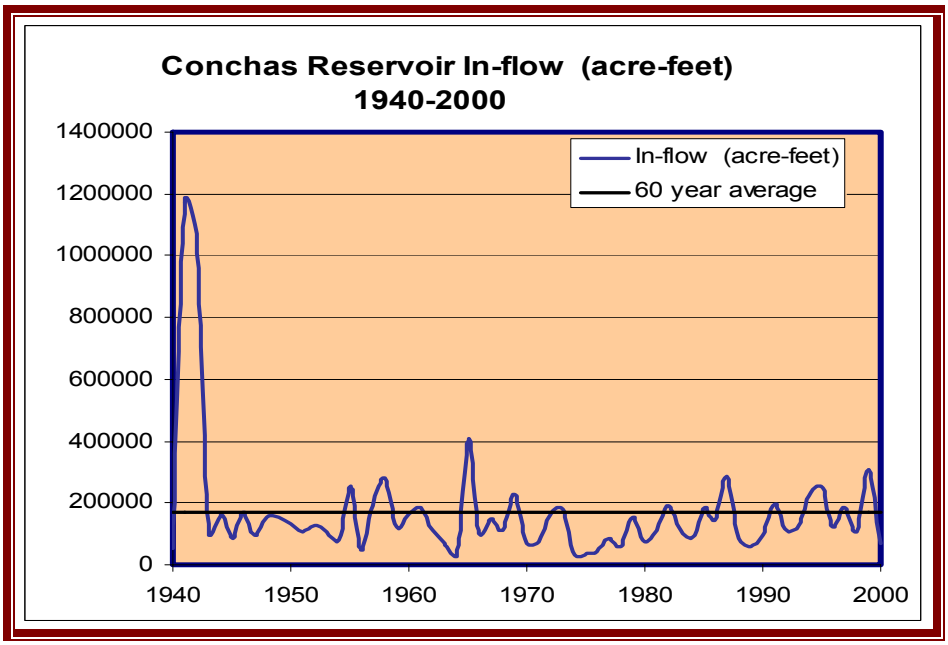
Source: EPA

Figure 5-2. Monthly Flow Into and Out of Conchas Reservoir



Surface water supplies approximately 94 percent of the water currently used in Quay County. Surface water availability varies greatly from year to year, with the highest flow years supplying many times more water than the drier years. Since the availability of surface water from year to year is dependent on the amount of precipitation in the region, historical climatic trends are discussed in Section 5.1.3.

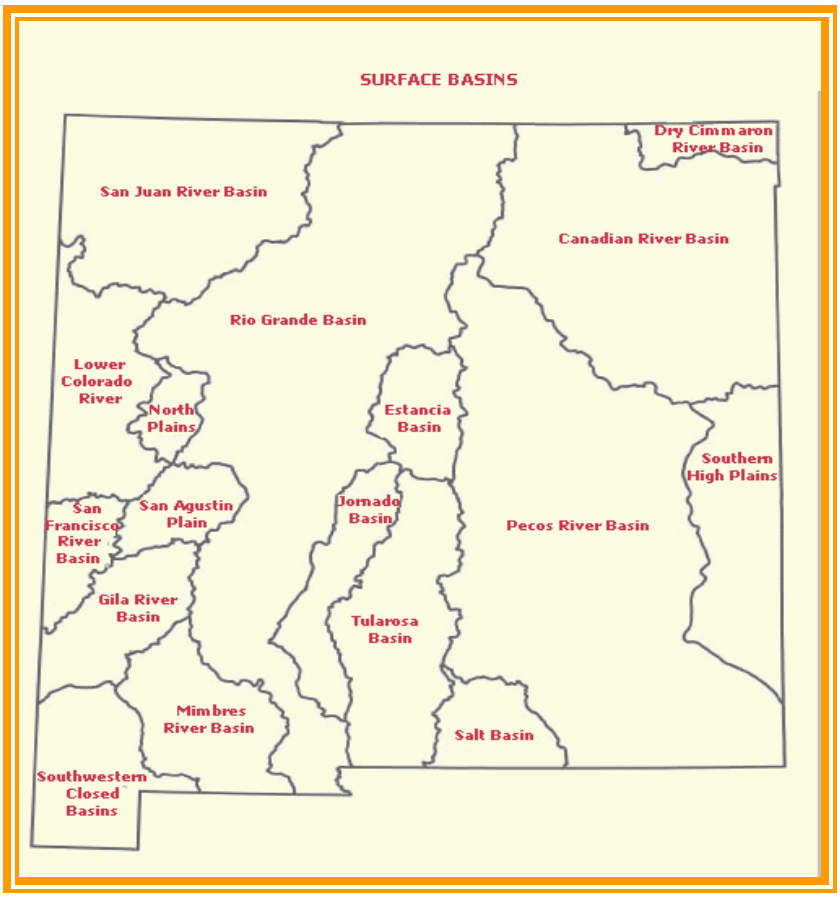
Figure 5-3. Conchas Reservoir In-Flow, 1940-2000



5.1.1 General Hydrologic Setting

Nearly all of the surface waters of Quay County lie within the Arkansas/White/Red River basin, which ultimately drains to the Mississippi River. The Arkansas/White/Red River Basin in Quay County is mostly drained by the Canadian River and its tributaries.

Figure 5-4. Surface Water Basins



Ute Lake Reservoir is the only reservoir of significant size in Quay County (Appendix B, Figure B-5 Conchas Dam Reservoir is important to Quay county since it is directly upstream of the county and is the source for the water used by Arch Hurley Conservancy District for irrigation purposes.

5.1.2 Summary of Climatic Conditions

The terrain of Quay County is not significantly varied which results in slight climate variations throughout the county. Temperatures range from average lows near 40 degrees Fahrenheit (°F) to highs well in excess of 100°F. A number of climate data collection stations are located in Quay County (Figure 4-2). Table 5-3 lists the periods of record for the weather stations in Quay County and identifies the stations. As shown in Figure 5-3, the average temperature at the 9 stations for 1950 through 1999 was fairly consistent, ranging between about 55 and 59 degrees Fahrenheit. Average temperatures showed a slight increase over the period of record, with most of the increase coming from rising minimum temperatures.

Table 5-3. Climate Station Periods of Record

Station Name	PERIOD OF OBSERVATION	Avg. Maximum Temp. (°F)	Avg. Mean Temp. (°F)	Avg. Minimum Temp. (°F)	Avg. Total Snowfall (in.)	Avg. Precip. (in.)	Active?
NEWKIRK	**9/ 1/1940 to 3/31/2003**	**73.2**	**57.6**	**42.0**	**16.8**	**14.64**	**YES**
MC CARTY RANCH	**11/1/1983 to 3/31/2003**	**69.6**	**55.4**	**41.3**	**18.8**	**17.08**	**YES**
RINESTINE RANCH	10/1/1968 to 10/31/1983	72.1	56.7	41.1	**	15.13	NO
OBAR	6/1/1938 to 6/30/1968	73.4	57.2	41.0	10.8	16.20	NO
UTE DAM	2/1/1965 to 8/31/1979	73.2	58.2	43.1	12.2	14.58	NO
LOGAN	1/1/1914 to 1/31/1960	75.1	58.6	42.1	**	15.81	NO
TUCUMCARI 4 NE	**12/16/1904 to 3/31/2003**	**73.2**	**58.4**	**43.5**	**16.0**	**15.96**	**YES**
TUCUMCARI FAA AIRPORT	1/ 1/1941 to 9/30/1982	72.7	58.2	43.6	11.1	14.38	NO
SAN JON	**1/1/1914 to 3/31/2003**	**73.5**	**58.5**	**43.5**	**16.2**	**16.68**	**YES**
CAMERON	1/ 1/1948 to 5/31/1998	70.5	55.6	40.7	14.1	18.26	NO
RAGLAND 3 SSW	**2/1/1935 to 3/31/2003**	**70.3**	**55.5**	**40.7**	**19.6**	**17.74**	**YES**

** DATA INCOMPLETE
Source: Western Regional Climate Center

Precipitation varies somewhat across the county and is influenced by location and somewhat by elevation. Weather systems may enter the county from the west (Pacific), northeast (Arctic air masses from the plains), and southwest (Gulf of Mexico), and each of these systems brings a unique set of temperatures and moisture to the county. Figure 5-5 shows the maximum, minimum, and long-term average precipitation (rainfall and snowmelt) at the 9 stations (tabulated precipitation data for the five (5) active stations are included in Appendix L). Average precipitation, including both snowmelt and rainfall, ranges from about 14.5 to 18.5 inches.

Figure 5-6 shows the average annual precipitation (for the period studied) in relation to elevation. Only the climate stations with the most complete records during the 1950 through 2003 period are shown in this figure. All of the plotted data represent stations that have been operated since 1950. The average precipitation varies little throughout the county with elevation slightly influencing the average totals.

Figure 5-5. Average Precipitation in Quay County

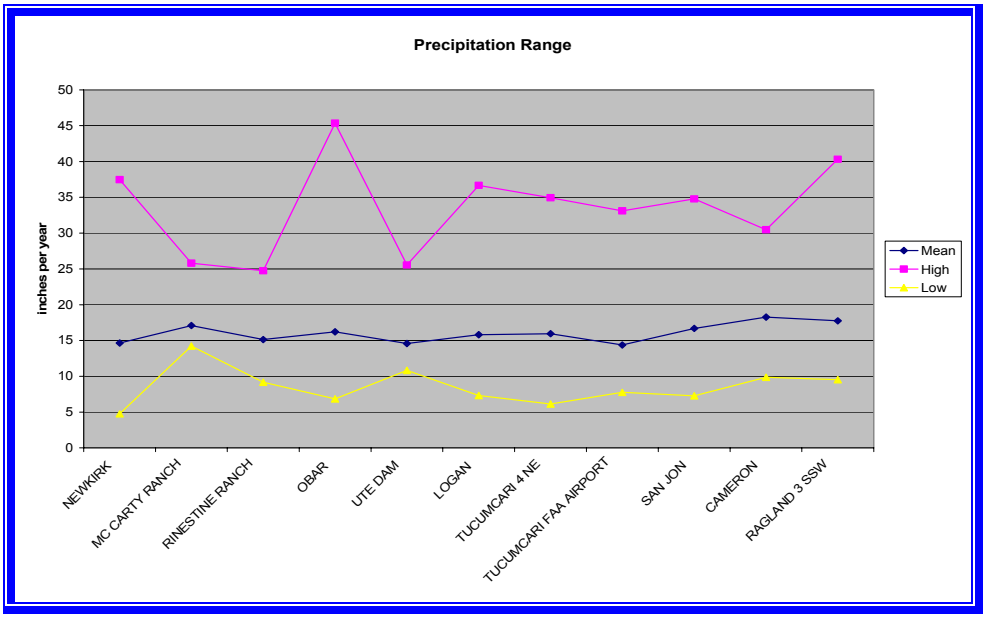
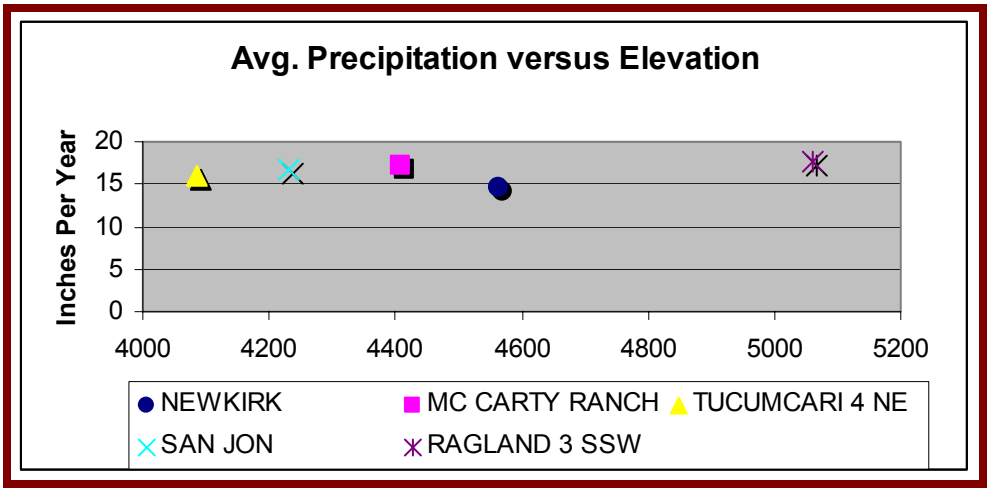


Figure 5-6. Average Precipitation versus Elevation



Figures 5-7, 8, 9, & 10 shows the long-term trends in precipitation at four selected stations. The annual amounts have all been normalized to the average depth during that period; that is, the annual precipitation total for each year is expressed as a percentage of the long-term average annual precipitation amount for the selected period of record. With the exception of the last two years, which were below-average years, the graphs show a slight upward trend, with most years the early to mid-1980s showing higher than average precipitation depths.

Figure 5-7. Newkirk

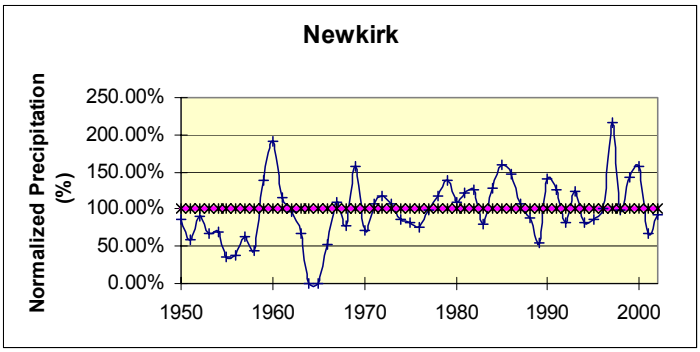


Figure 5-8. Tucumcari 4 NE

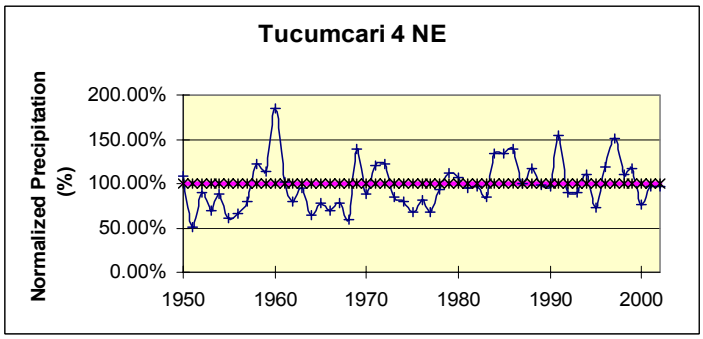


Figure 5-9. San Jon

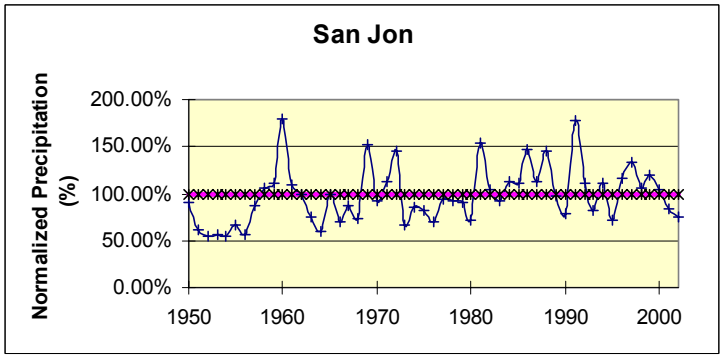
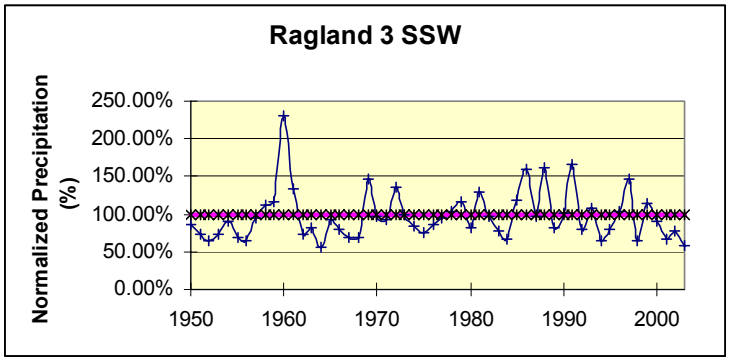


Figure 5-10. Ragland 3 SSW



5.1.2.1 The Palmer Drought Severity Index

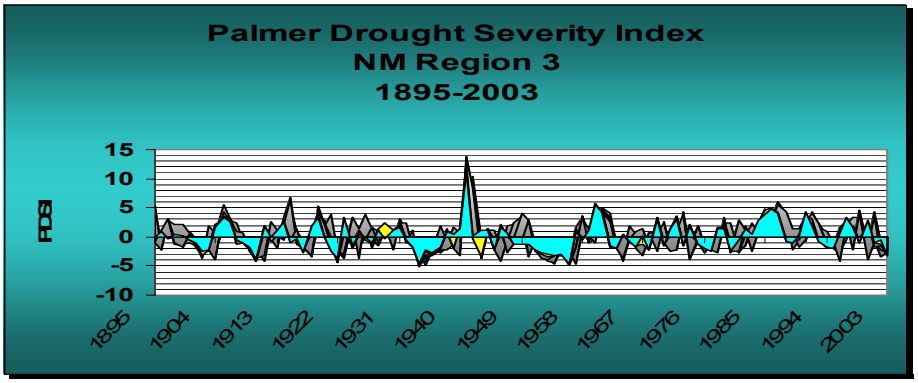
A drought index consists of a ranking system derived from the assimilation of data, including rainfall, snow pack, stream flow, and other water supply indicators for a given region. Consulting drought indices can aid in water supply and agricultural planning and decision making. The PDSI was created by W.C. Palmer (1965) to measure the variations in the moisture supply and is based upon the supply-and-demand concept of the water balance equation. Hayes (1999) provides a thorough explanation of the PDSI, which is summarized here. The PDSI is calculated using precipitation and temperature data as well as the available water content (AWC) of the soil. These data are used to calculate all the components of the water balance equation including evapotranspiration, soil recharge, runoff, and moisture loss from the surface layer. Moisture conditions are standardized so that comparisons between different locations and between months can be made. The index is widely used because it provides an assessment of the abnormality of recent weather relative to historical conditions. The PDSI classifications for dry to wet periods are provided in Table 5-4. Many states including New Mexico incorporate the PDSI into their drought monitoring systems.

Table 5-4. Palmer Drought Severity Index Classifications

Classification	Description
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to –0.49	Near normal
–0.5 to –0.99	Incipient dry spell
–1.0 to –1.99	Mild drought
–2.0 to –2.99	Moderate drought
–3.0 to –3.99	Severe drought
–4.0 or less	Extreme drought

The PDSI is calculated for climate divisions throughout the United States. Quay County is within one climate division: the northeastern plains, NM Region Number 3. Figure 5-11 shows the long-term PDSI.

Figure 5-11. Monthly Palmer Drought Severity Index for New Mexico Climate Division 3, 1895 Through 2003



Although the precipitation trend shows a slight increase for the period of analysis, that trend should not be cause for overconfidence that the water supply is increasing. In fact, in 2002 and 2003 the PDSI dipped to one of its lowest index value recorded (coincident with water year stream flow at the Canadian River Sanchez gage, (which was the also some of the lowest in the 89 year period of record). These changes will affect the water supply in Quay County over the next 40 years. At this time, there is no accurate predictor of specific climatic changes to be expected in Quay County over the 40-year planning horizon. However, the knowledge that changes may occur should be incorporated into drought planning activities and into subsequent phases of the regional water planning process. The Weekly Palmer Drought Severity Index Forecast by Division prepared by NOAA, 3/24/2004 is shown if Figure 5-12. The forecast indicates that Quay County is near normal. This forecast is based on the precipitation received in early 2004. The current drought status for Quay county as shown in Figure 5-13 shows that Quay County is still considered to be in an extreme drought condition.

Figure 5-12. PDSI Forecast, 3/20/2004

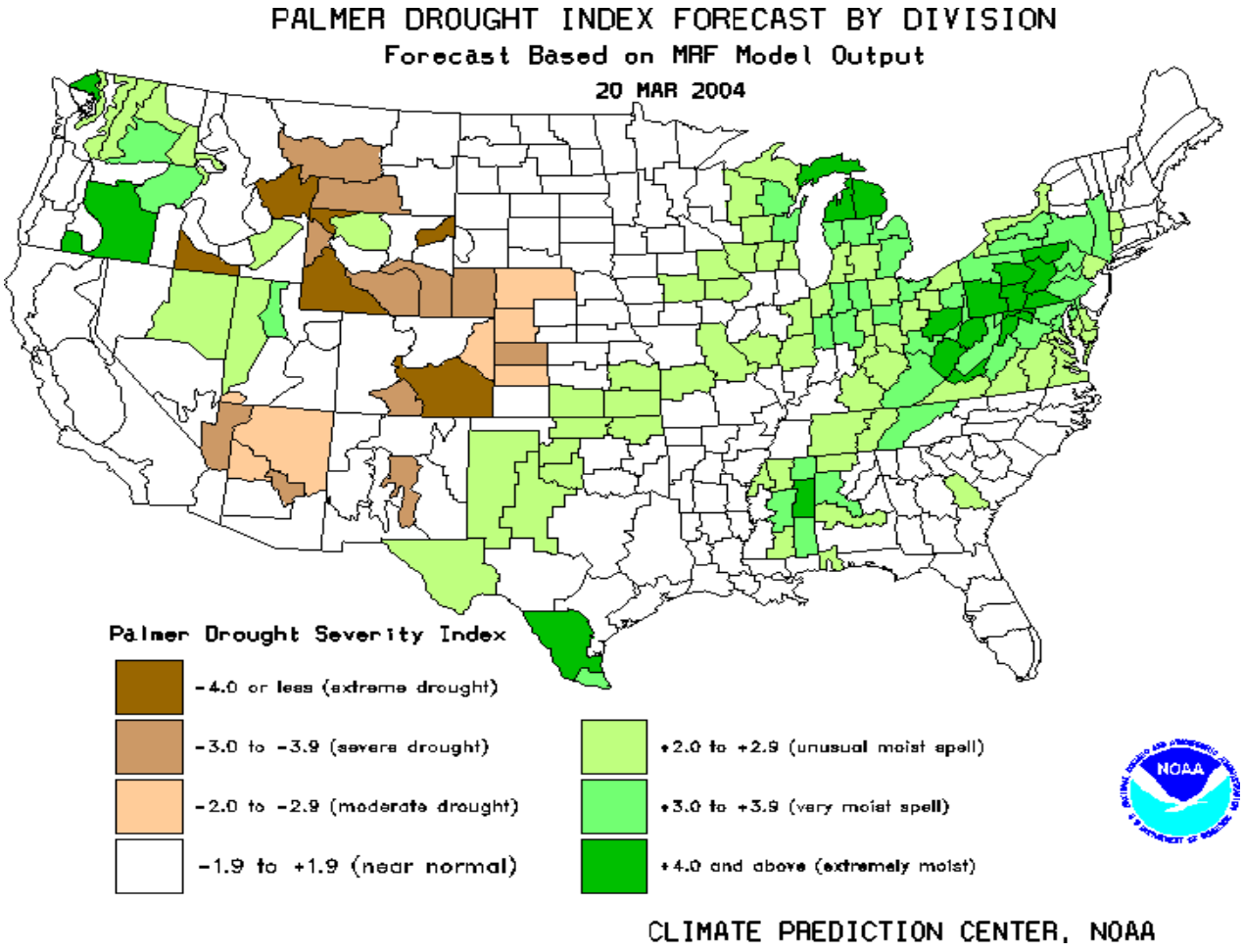
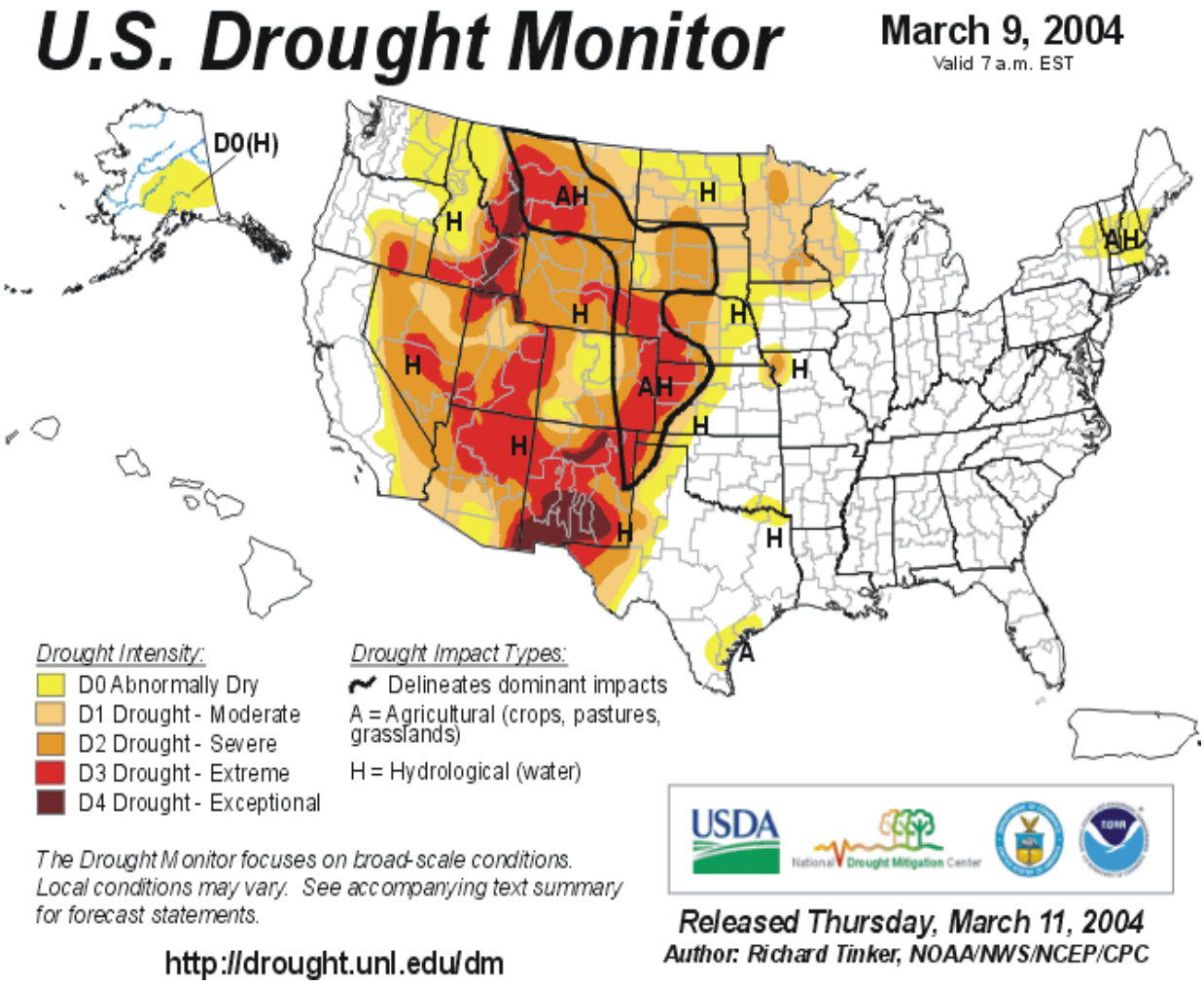


Figure 5-13. US Drought Monitor 03/2004



5.1.3 Summary of Stream Flow Data

Stream flow data are collected by the USGS from several gages in Quay County. Graphs illustrating Historical Avg. monthly stream flow for the stations are presented IN Figures 5-14 to 5-16.

Table 5-5 lists the locations, periods of record, and types of records collected at all the stream gages in Quay County. As indicated in Table 5-5, many of the stations only collected peak flow data or were only operational for a short period of time.

Figures 5-14 through 5-16. Stream Flow Data at Selected Gages

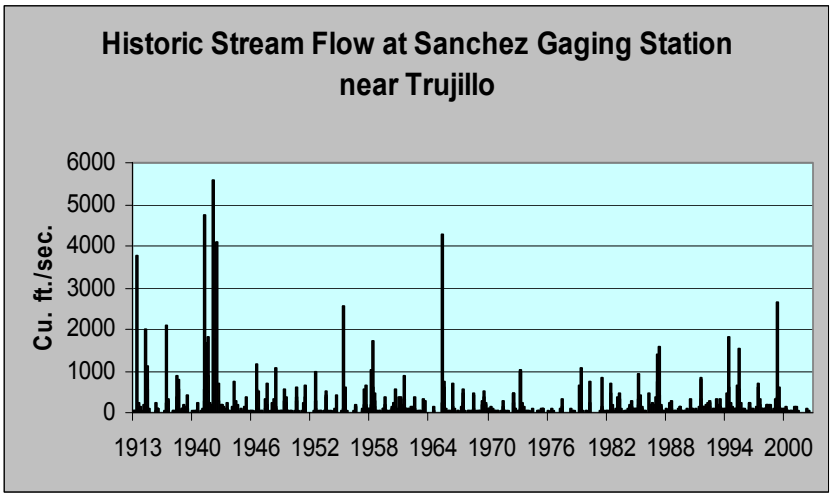
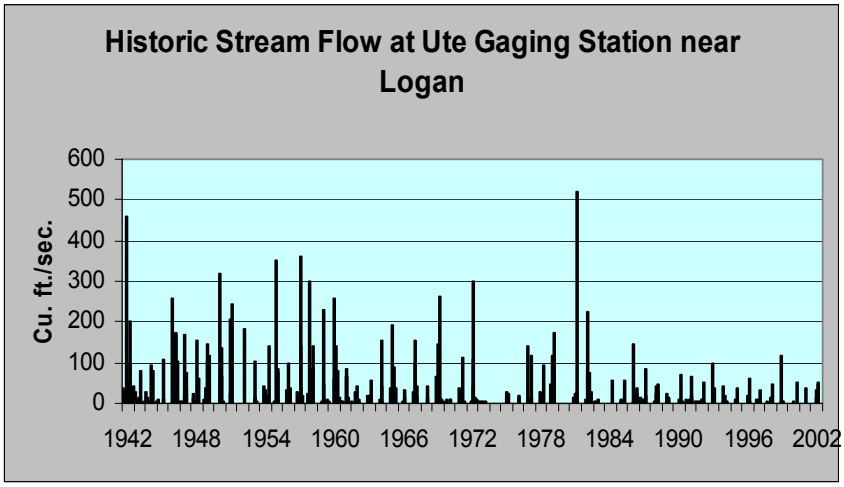
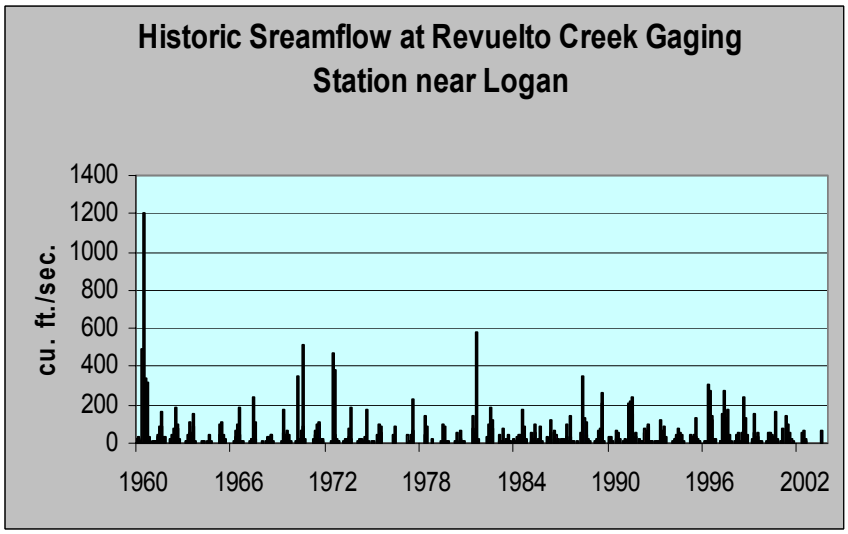
Stream Flow Data at Selected Gages	
Figure 5-14	
Figure 5-15	
Figure 5-16	

Table 5-5. Stream flow Gaging Stations in Quay County

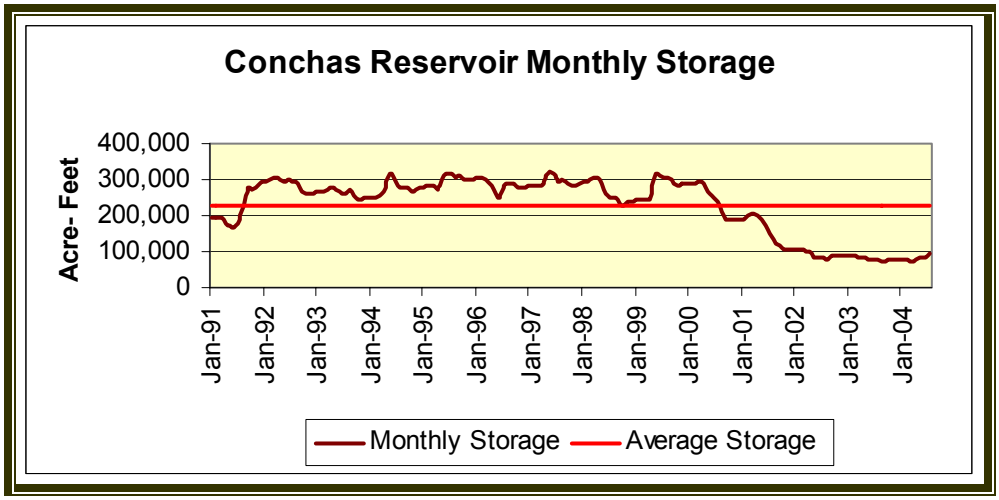
USGS STREAMFLOW GAUGES IN QUAY COUNTY					
Site Number	Site Name	LOCATION	Datum	Data Type	Begin Date
7225300	BLUEWATER CREEK NR TUCUMCARI, NM	Latitude 35°08'31", Longitude 103°47'32" NAD27,	4,100	Peak Stream flow	8/8/1971
7226800	UTE RESERVOIR NEAR LOGAN, NM	Latitude 35°20'35", Longitude 103°26'37" NAD27		Real Time	3/26/1963
7227000	CANADIAN RIVER AT LOGAN, NM	Latitude 35°21'25", Longitude 103°25'03" NAD27	3668.1	Peak Stream flow Daily Stream flow	9/30/1904
7227050	PLAZA LARGA CR TRIB NEAER RAGLAND, NM	Latitude 34°50'00", Longitude 103°45'00" NAD27	4590	Peak Stream flow	8/12/1952
7227100	REVUELTO CREEK NEAR LOGAN, NM	Latitude 35°20'28", Longitude 103°23'40" NAD27	3665	Peak Stream flow Daily Stream flow	8/1/1959
7227150	ARROYO DEL PUERTO NR ENDEE, NM	Latitude 35°03'32", Longitude 103°06'04" NAD27		Peak Stream flow	1/9/1981
8385530	ALAMOSA CREEK TRIBUTARY NEAR JORDAN, NM	Latitude 34°48'00", Longitude 103°58'00" NAD27	4910	Peak Stream flow	9/19/1962

5.1.4 Conchas and Ute Reservoirs.

Conchas Dam, constructed by the Corps of Engineers on the Canadian River, is a concrete gravity section flanked by embankment wings. The dam has a structural height of 235 feet, a crest length of 6,230 feet, and a volume of 836,000 cubic yards of concrete and 887,000 cubic

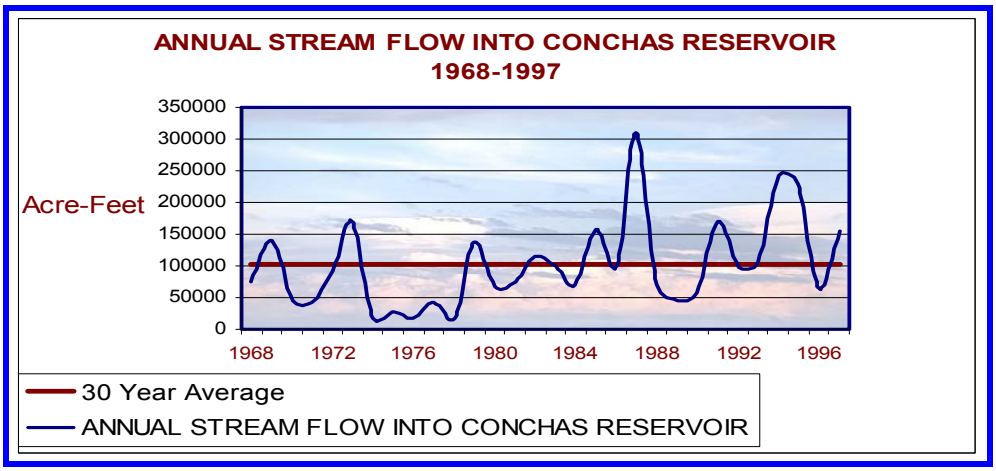
yards of earth. The main spillway is an overflow section 300 feet long in the main section of the dam. An emergency spillway, located on the north dike, is 3,000 feet long and is 17 feet higher than the main spillway. The irrigation outlet works is a circular pressure tunnel leading to the gate chamber, then into two steel penstocks in a horseshoe tunnel. The reservoir has a capacity of 528,951 acre-feet, of which 252,334 acre-feet are conservation storage. The Monthly Storage of Conchas Reservoir is shown in Figure 5-14. The data shows that since 1991 that the Reservoir was storing well over 200,000 acre-feet until mid 2001 when the storage dropped significantly to below 100,000 acre-feet. This reduction in storage is the result of the reduced stream flow in the Canadian Basin due to the drought conditions. The Arch Hurley Irrigation District received minimal irrigation flow in 2002 and none in 2003 or in 2004.

Figure 5-17. Conchas Reservoir Monthly Storage



Source: USACE

Figure 5-18. Annual Stream Flow into Conchas Reservoir



Source: USACE

Ute Dam and Reservoir was authorized by the New Mexico State Legislature in 1957 and 1959. The initial stage of Ute Dam and Reservoir was completed in 1962 with total capacity at spillway crest elevation of about 110,000 acre-feet. Ute Reservoir was operated to maintain a minimum pool when inflow permitted of 50,000 acre-feet for fish and wildlife and recreation purposes. In 1975, 1978 and 1981 the New Mexico State Legislature authorized funding for additional

construction to increase the size of Ute Reservoir. The Interstate Stream Commission contracted with the Bureau of Reclamation on a reimbursable basis to prepare plans and specifications and supervise additional construction at Ute Dam to increase the controlled storage capacity of the reservoir to about 272,000 acre-feet. The Bureau of Reclamation prepared a feasibility report that proposed the most economical means of increasing the storage capacity of Ute Dam by construction of a labyrinth spillway within the existing spillway opening in the dam, and raising the height of the dam and dike embankments. The State of New Mexico proceeded and awarded a construction contract in accordance with the design prepared by the Bureau of Reclamation. Construction of the Ute Dam Modification Project was completed in February 1984 and water storage was allowed to increase that year. Unusually abundant precipitation in the Canadian River Basin in the fall and winter of 1986-1987 resulted in the spill and release of water from Conchas Reservoir as well as inflow from the drainage basin of the Canadian River below Conchas Dam which filled the enlarged Ute Reservoir for the first time.

The Monthly Storage of Ute Reservoir shows that the storage within Ute Reservoir has fluctuated from 165,000 to 250,000 acre-feet since April 1987. The current storage of Ute Reservoir is at approximately 152,000 acre- feet. This storage level is consistent with the storage levels since 1994 except for a significant increase in 2000. The storage level appears to be less affected by the drought to date than the Conchas Reservoir.

Figure 5-19. Real-time data from Ute Reservoir Gage, Mar. 26 - Apr. 02, 2004

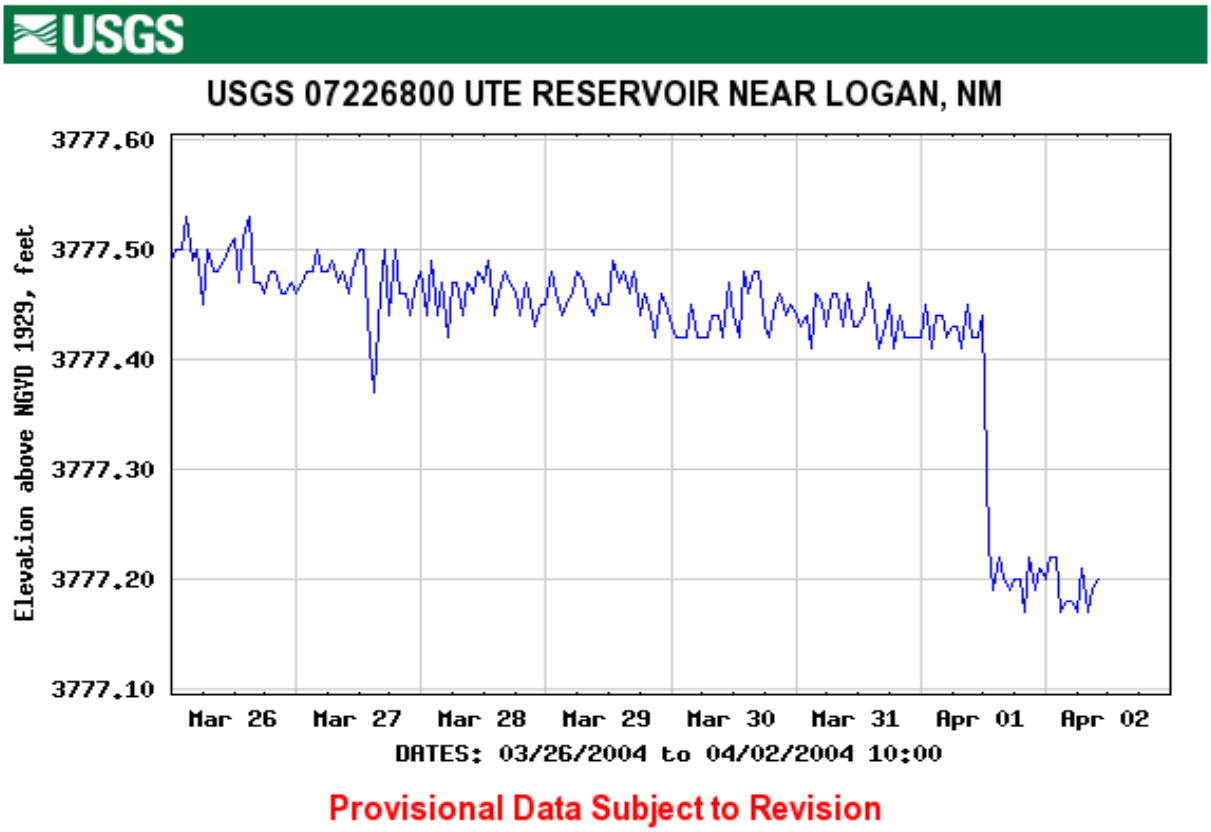
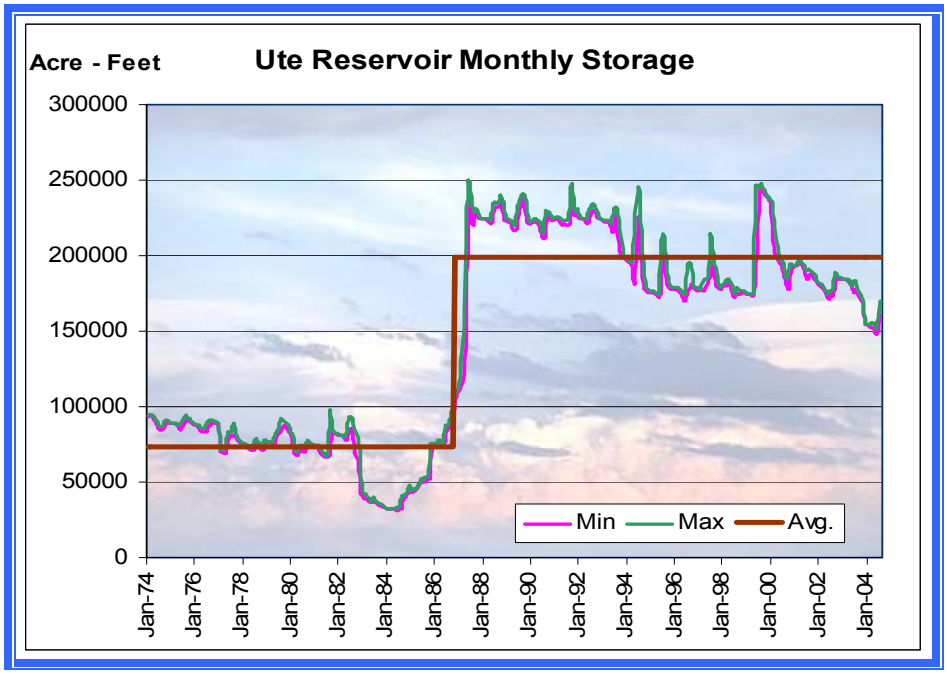
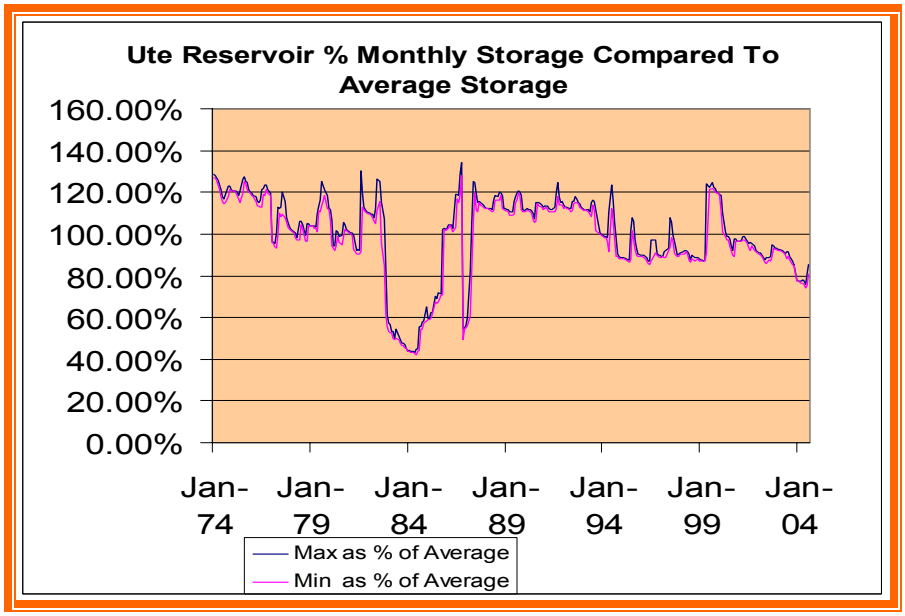


Figure 5-20. Ute Reservoir Monthly Storage



SOURCE: USGS

Figure 5-21. Monthly Storage Compared to Average Storage in Percent



The Ute Water commission (UWC) was formed by Joint Powers Agreement for the purpose of contracting with the ISC for purchase of Ute Reservoir water. Participating agencies making up the UWC and the Eastern NM Rural Water Authority (ENMRWA) include the communities of Clovis, Elida, Grady, Logan, Melrose, Portales, San Jon, Texico, and Tucumcari; and the counties of Curry, Roosevelt, and Quay. Cannon Air Force Base has a reservation of water but their water is supplied by the City of Clovis. The ENMRWA was formed subsequent to the UWC for the purpose of advanced

planning, design, construction and operation of the facilities. A 1994 study by the New Mexico Interstate Streams Commission (ISC) estimated the ***annual yield*** to be 24,000 acre-feet per year in all but extreme drought years. The 24,000 acre-feet estimated yield has been reserved by the following Communities and Counties as listed in Table 5-6.

Table 5-6. Annual Reservation of Ute Reservoir Water

Community	Acre-Feet Reserved
Logan	400
San Jon	150
Tucumcari	6,000
Quay Co.	1,000
Quay Co. Totals	7,550
Cannon	2,150
Clovis	10,142
Texico	250
Grady	75
Melrose	250
Curry Co.	100
Curry County Totals	12,967
Portales	3,333
Elida	50
Roosevelt Co.	100
Roosevelt Co. Totals	3,483
Total UWC	24,000

As shown in Table 5-6 the communities and Quay County have reserved 7,550 acre-feet of the 24,000 acre-feet available annually from Ute Reservoir.

Quay County has reserved 1,000 acre-feet for dairy, agricultural processing and general economic development purposes. Dairy is underdeveloped - Quay farmers produce and sell hay out-of-county since local demand has not sufficiently developed. Also water may be made available for development of new subdivisions. It may also be made available for exchange in order to obtain right-of-way. There is no regional water distribution infrastructure for the whole of Quay County.

Tucumcari has reserved 6,000 acre-feet for economic development and for aquifer recharge and improved water quality. There is a desire to diversify the economic base and entice agriculture or industrial processing plants.
Logan, which is adjacent to the reservoir, has reserved 400 acre-feet for municipal or commercial use. Possibilities are to supply a golf course or a factory or for recreational purposes, given their proximity to the Lake.

San Jon has reserved 150 acre-feet. Their well field draws water from the alluvium overlying the relatively impermeable Chinle formation. Such shallow alluvial aquifers are vulnerable to contamination by surface activities. They currently have to filter their water with expensive RO

equipment in order to reduce elevated levels of fluorides and nitrates in the water from their well field. The Village of San Jon is in need of either potable water as an alternative to their supply, or raw water to dilute their well field.

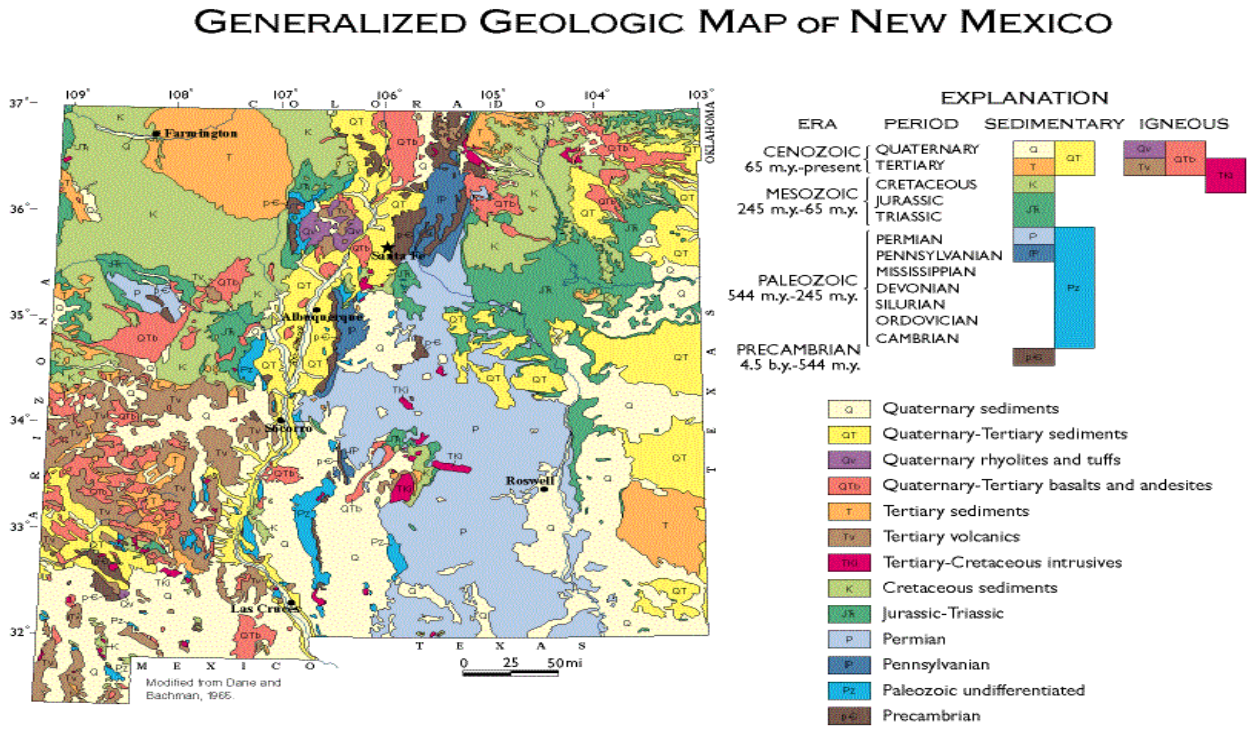
5.2 Groundwater Supply

Though much of the water supply needs of the Quay County are met through surface water resources, groundwater is an important resource that is used to meet 6% of the overall demands of the County as well as 100% of municipal water production. In order to actively manage groundwater resources in New Mexico, the New Mexico Office of the State Engineer (OSE) has the authority to delineate groundwater basins that require a permit for groundwater withdrawals; these basins are referred to as “declared underground water basins.” Quay County encompasses parts of two declared underground water basins (Figure 4-3): the Northern three-fourths of the county lies within the lies within the Tucumcari Basin while the southwestern corner of the county lies within the Fort Sumner Basin. There are two small areas of the county South central portion of the county, Near Forrest, and far northeastern part of the county, near Nara Visa, that are in undeclared basins.

5.2.1 Hydrogeologic Framework

The occurrence of groundwater in is controlled by varying hydro geologic conditions, dependent upon localized geologic structures, stratigraphy, and geologic formation lithologies.

Figure 5-22. Generalized Geologic Map of New Mexico



Surface Geology of the county is illustrated in Figure 5-22. Sedimentary rock types present include shale, mudstone, siltstone, fine- to coarse-grained sandstone, conglomerate, dolomite, limestone, and anhydrite. At the surface, these sequences are intermittently capped with unconsolidated alluvial, pediment, and terrace deposits of Quaternary age.

5.2.2 Primary Water Bearing Formations

The major geologic formations that occur in Quay County.

- Quaternary-age alluvium, pediment, and terrace deposits
- Tertiary age Ogallala
- Cretaceous age Sandstones
- Jurassic age Entrada Sandstone.

The City of Tucumcari is supplied water through 22 wells. The 2 wells in the Hoover Well Field and the 11 wells in the metro well field pump water from the Entrada Sandstone formation. The remaining wells in the Town Field pump water from Alluvium deposits. OSE Technical Report No. 30, Trauger and Bushman, 1964, estimated that the Entrada formation contained approximately 2.6 million acre-feet of water. The report theorized that at 10% recovery that 260,000 acre-feet would be available. The estimated life expectancy of the Entrada Sandstone ground-water reservoir at 1250 acre-feet annual withdrawal was several hundred years.

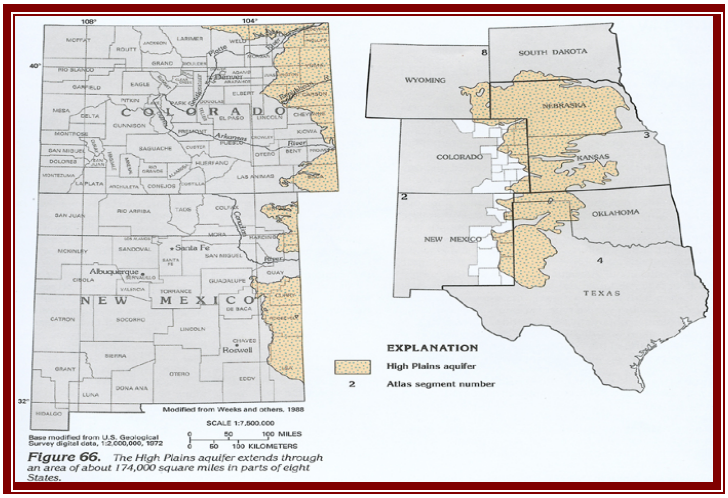
The alluvium aquifer underlying Tucumcari was nearly depleted by ground-water pumping from 1900-1945, Trauger and Bushman. In 1946, the Tucumcari Project began delivery of water to The Arch Hurley Conservancy District. The water delivery to the irrigation project via unlined canals led to the recharge of the alluvium. By 1953 water elevation in some wells in town were higher than when they were drilled, Trauger and Bushman, 1964.

The Village of Logan is served by 8 wells in around Logan. Berkstresser, et al, 1966, identified the water bearing formation on the north side of Ute Reservoir as the Santa Rosa Sandstone, with a total thickness of about 400 ft. Subsequent investigations have assigned the upper 140 ft. ± to the Chinle Formation (Trujillo Sandstone). Very little hydrologic data is available concerning the hydraulic conductivity of the Santa Rosa Sandstone. Berkstresser, 1966, reports a Chicago, Rock Island, and Pacific Railroad well near Logan, New Mexico (T13N, R13E, Sec. 11.3.2.2) having a specific capacity of 0.57 gpm/ft at 50 gpm. NMSEO, 2002, reports four irrigation wells on the north side of Ute Reservoir having declared water rights ranging from 1.3 AF/yr to 223 AF/yr. The well
with a right of 223 AF/yr was owned by O.O. and Jr. Osborn, but the water rights have been purchased and transferred to the Village of Logan.. It is located in T13N, R33E, Sec. 8.2.2.4. The well is reported to be 404 ft deep. It probably penetrates all of Berkstresser's Santa Rosa Sandstone (Smith Engineeering,2003).

5.2.2.1 The Ogallala Formation

The Ogallala Formation is a well known and highly developed aquifer that covers an extensive area of the Great Plains. Its occurrence in Quay County from the Caprock escarpment south and in the far Northeastern corner near Nara Visa.

Figure 5-23. High Plains Aquifer (Ogallala)



5.2.3 Lake Meredith Salinity Control Project

(www.crmwa.com/lmscp2.htm)

Since beginning deliveries of water to member Texas cities of the Canadian River Municipal Water Authority in 1968, there has been concern about the quality of water available from Lake Meredith. While it was realized that the lake water would be somewhat mineralized, the change in water supply from groundwater was extremely objectionable to some citizens. A generally increasing trend of chloride content (salt) has occurred, with drought cycles producing chloride contents as high as 475 mg/L. Federal Drinking Water Standards recommend maximum chloride contents in drinking water of 250 mg/L and State standards are 300 mg/L. Continuing problems with corrosiveness and mineral deposition accompany the salty taste. Beginning in 1969, the Authority and other agencies have sought to identify the source of the salt water and to determine whether or not water quality in Lake Meredith could be improved. An area in New Mexico just downstream from Ute Dam near Logan was early identified as being a major contributor of saline water to the Canadian River System. Studies by the Bureau of Reclamation and consultants indicate that about 70 percent of the chlorides reaching Lake Meredith originate in this localized area, filtering into the river channel from a shallow brine aquifer which is under artesian pressure. Water in the brine aquifer is roughly as salty as seawater.

Figure 5- 24. Schematic of the Source and a rough depiction of the cure.

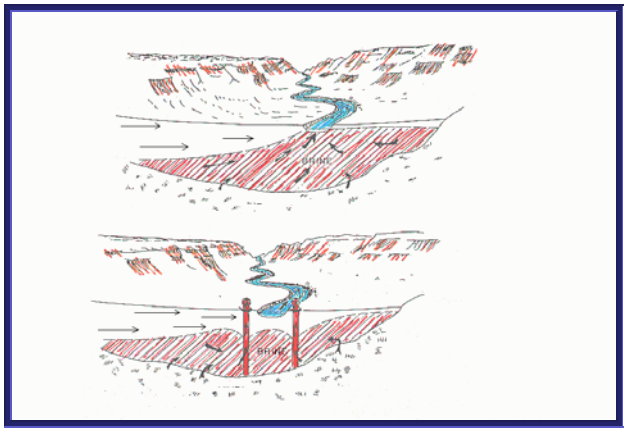
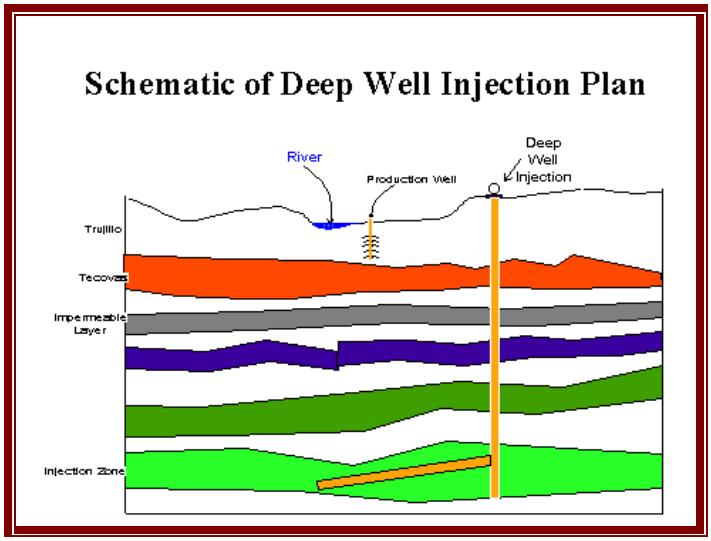


Figure 5-25. Sketch roughly showing Brine Disposal



5.2.3.1 Project

The Salinity Control Project is expected to have a total price tag of $10 million. It consists of one deep injection well completed both vertically and horizontally. There are expected to be between 6 and 11 shallow production wells. The Lake Meredith Salinity Control Project was placed in operation in September of 2001, producing water from seven wells and injecting at a rate of 250 gpm.

FIGURE 5-26. LAKE MEREDITH SALINITY CONTROL PROJECT HEADQUARTERS NEAR LOGAN, NEW MEXICO	
Figure 5-27. Production well in Canadian River near Logan, New Mexico	

5.2.3.2 Benefit to Quay County

The project is capable of producing 250 gpm of salt water (Brine) that if treated can be used for Municipal or Industrial purposes. This would eliminate the injection of the saltwater and result in a source of water. A pilot desalinization project is being implemented in Otero county and Quay County and the Canadian River Municipality Water Authority may benefit from pursuing a partnership to treat this source of water.

5.3 Water Quality Assessment

Assurance of availability to meet future water demands requires not only sufficient quantity of water, but also water that is of sufficient quality for the intended use. In order to meet drinking water quality standards, most water supplies require at least a minimal amount of treatment. Should the water quality of the drinking water supply become significantly degraded, additional and costly treatment must be provided or additional water supplies located. Where drinking water supply options are limited, water quality impairment can be a significant and expensive problem. Although standards are generally not as high for other uses (i.e., irrigation and livestock uses), water quality must nevertheless be high enough to meet these uses, or expensive treatment will be required.

5.3.1 Surface Water

Potential sources of contamination and measured impacts to surface water bodies are described in Sections 5.3.1.1 and 5.3.1.2, respectively.

5.3.1.1 Potential Sources of Contamination

Sources of contamination are considered point sources if they originate from a single location or non-point sources if they originate over a more widespread or unspecified location. Potential point source discharges must comply with the Clean Water Act and the New Mexico Water Quality Standards by obtaining a permit to discharge. These permits are referred to as National Pollutant Discharge Elimination System (NPDES) permits. A summary of NPDES permitted discharges is included in Table 5-7 (NMED, 2001b).

Table 5-7. Quay County Municipal and Industrial NPDES Permittees

NMED DISTRICT IV			
Chaves, Curry, De Baca, Eddy, Guadalupe, Lea, Lincoln, Quay and Roosevelt Counties:			
Permit No:	Municipalities:	Status:	County:
NM0020711	Tucumcari	Major	Quay

The permit issued to the City of Tucumcari is for discharge of effluent from the Sewage Treatment Facility.

Table 5-8. List of NMED Discharge Permits within Quay County

NMED Discharge Permits within Quay County									
Discharge Permit Number	Nearest Municipality	Status	Facility Name	Waste Type	Treatment	Discharge	Gpd	Approved	Expires
1054	LOGAN	A	LAKE MEREDITH SALINITY CONTR	DOE/DOD	NONE	INJECTION WELL	1034000	16-Dec-98	16-Dec-03
1125	NARA VISA	A	STULL TRAILER WASH	VEHICLE/EQUIP. WASH	LAGOON	LAND APPLICATION	3600	24-Mar-97	24-Mar-02
535	SAN JON	A	SAN JON (VILLAGE OF) - WWTP	MUNICIPALITY	CONSTRUCTED WETLANDS	EVAPORATION LAGOON	33000	31-Aug-95	31-Aug-00
1017	TUCUMCARI	A	QUAIL HILL FARM	SLUDGE DISPOSAL FACILITY	OTHER	LAND APPLICATION	47	4-Sep-00	4-Sep-05
19	TUCUMCARI	D	BREEN RANCH	MUNICIPALITY	WWTP	LAND APPLICATION	2678		
1258	TUCUMCARI	P	TUCUMCARI MOUNTAIN CHEESE FACTORY	CHEESE, MILK OR FOOD PROC	NONE	LAND APPLICATION	11430		
442	TUCUMCARI	T	SIXTY SIX PACKING COMPANY	MEAT PACKING	LAGOON	LAND APPLICATION	20250	22-Jul-87	22-Jul-92

Non-point sources of pollutants are a major concern for surface water in Quay County. Among the most prevalent of these sources are the effects of historical grazing practices. Additional probable sources of pollutants or threats to surface waters are agriculture, resource extraction, recreation, hydro-modification, road runoff, silvicultural activities, road construction, building sites, and septic tanks. Specific pollutants or threats to surface water quality resulting from these non-point sources are turbidity, stream bottom deposits, nutrients, metals, pathogens, total phosphorus, temperature extremes, total ammonia, problems with pH, habitat alteration, and overall watershed condition (NMED, 2003b).

5.3.1.2 Existing Surface Water Quality

As discussed in Section 5.1, Quay County is mostly drained by the Canadian River and its tributaries. Water quality is generally good; however, both the Conchas and Ute Reservoirs within the Canadian Basin have been listed on the 2000-2002 New Mexico 303(d) list (NMED, 2001b). This list is prepared by NMED to comply with Section 303(d) of the federal Clean Water Act, which requires each state to identify surface waters within its boundaries that are not meeting or not expected to meet water quality standards. Table 5-9 lists both of the Reservoirs in Quay County that are on the 303(d) list.
Section 303(d) further requires the states to prioritize their listed waters for development of total maximum daily load (TMDL) management plans. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state water quality standard. It also allocates that load capacity to known point sources and non-point sources at a given flow.

Table 5-9. State of New Mexico Draft 2000-2002, §303(d) List for Assessed Stream and River Reaches in Quay County

2002-2004 STATE OF NEW MEXICO 303(d) LIST FOR ASSESSED RIVER/STREAM REACHES REQUIRING TOTAL MAXIMUM DAILY LOADS (TMDLs) AFFECTING QUAY COUNTY					
Water Body Name	Total Size Affected (acres)	Probable Source(s) of Pollutant	Specific Pollutant	Date TMDL Due	Uses Not Fully Supported
Conchas Reservoir Upper Canadian	4218.17	Road/ Parking lot runoff Removal of Riparian Vegetation Range grazing Riparian and/or Upland Habitat Modification (other than Hydro-modification) Grazing related Sources Bank or Shoreline Modification/Destabilization Atmospheric Deposition Agriculture	Mercury in fish tissue Plant Nutrients	12/31/2017	warm water fishery
Ute Reservoir Upper Canadian-Ute Reserve	3760.75	Road/ Parking lot runoff Range grazing Riparian and/or Upland Grazing related Sources Atmospheric Deposition Agriculture	Mercury in fish tissue Bottom Deposits Aluminum - chronic	12/31/2017	warm water fishery

Table 5-10. Waters with Fish Consumption Guidelines

Waters with Fish Consumption Guidelines Due to Mercury Contamination Revised February 2001				
Water Body Name	Total Size Affected (acres)	Probable Source(s) of Pollutant	Specific Pollutant	Acute Public Health Concern
Conchas Reservoir	4218.17	Atmospheric deposition	Hg	No
Ute Reservoir	3760.75	Atmospheric deposition	Hg	No
Source: NMED				

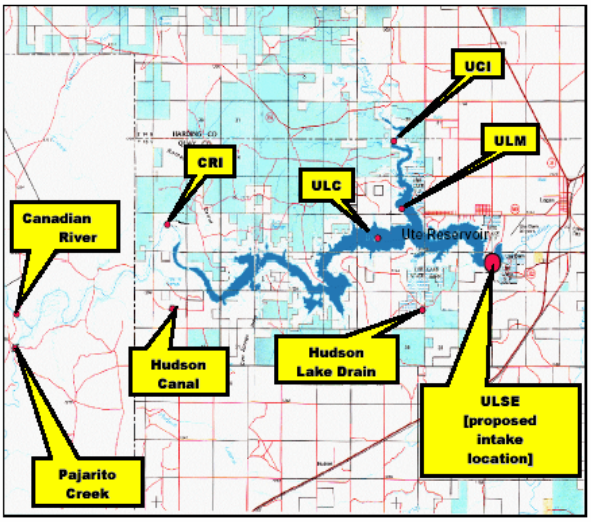
5.3.1.2.1 Report on Water Quality Monitoring and Testing Program Eastern New Mexico Rural Water System Project (Sear Brown, 2002)

Although significant historical water quality data exists for the Ute Reservoir, many parameters needed to be tested prior to the final selection of treatment processes for the ENMRWS. Therefore, a comprehensive water quality testing program was developed to (1) provide information necessary to build the database for a predictive reservoir model (CE-QUAL-W2), (2) to identify water treatment goals, and (3) to select the most appropriate water treatment

technologies. The formal water quality monitoring program began in June 2000 and ended in September 2002. Samples were taken every few months, two to five times per calendar year, with sampling events occurring in April through October.

Figure 5-28. Sear-Brown Sampling Locations

Figure 2.1: Sampling Locations



The proposed intake location for the ENMRWS water supply system is at the Ute Lake South East (ULSE) sample location, near the southeast end of Ute Lake. The USLE is the proposed intake location for the ENMRWS and was the major focus of the Sear Brown report. The laboratory data is summarized in Table 5-11.

Table 5-11. Summary of Water Quality Data, Sear Brown (2002)

		ULSE (proposed intake location)		All Locations***	
Parameter	Units	Average*	Range	Minimum	Maximum
Total N	mg/L	< 1.00 **	ND - 1.51	ND	3.07
Ammonia N	mg/L	< 0.10 **	ND - 0.20	ND	0.24
Nitrate N	mg/L	< 1.00 **	ND - 1.51	ND	3.07
Nitrite N	mg/L	< 0.01 **	ND	ND	0.022
Total P	mg/L	0.05	ND - 0.12	ND	1.8
Ortho P	mg/L	0.04	ND - 0.31	ND	1.1
TSS	mg/L	2.85	ND - 24	ND	4292
TDS	mg/L	695.4	650 - 739	574	1925
BOD_5	mg/L	0.3	ND - 2	ND	16.8
COD	mg/L	23.0	ND - 65	ND	77
DOC	mg/L	5.0	3.7 – 7.4	3.5	10.3
TOC	mg/L	4.6	4.0 - 7.5	4	12
Alkalinity	mg/L	184	170 - 210	152	286
As	µg/L	6	ND-10	ND	14
Ca	mg/L	55.3	48- 68.5	40.1	74.1
Hardness	mg $CaCO_3$/L	279	260 - 310	164	612
Fe	mg/L	< 0.019**	ND - 0.10	ND	50.77
Mg	mg/L	39.7	34.3-52.9	23.6	59.6
Mn	mg/L	0.05	ND - 0.24	ND	1.17
Hg	µg/L	< 0.2**	ND	ND	ND
Se	µg/L	< 4.0**	ND-4.0	ND	5.0
Sulfate	mg/L	291	228 - 345	198	660

ND = Non-Detect (below the detection limit)
* Data was averaged for all sampling events including events with "ND" results except where noted otherwise.
** Average result is listed as "less than the detection limit", rather than averaging the few results (if any) that were above the "ND" limit.
*** All nine lake and tributary locations (including the ULSE location)

5.3.1.2.2 Raw Water Characteristics Affecting Treatment Processes (ENMRWS Report, Smith Engineering, 2003)

A review of the raw water characteristics from the Ute reservoir was conducted to identify candidate water treatment processes. The review was based on information gathered in previous studies. The collection, sampling and analytical methods used in previous studies are not clearly indicated in all instances. In addition, many parameters typically monitored in potential source waters have not been tested, namely microbial contaminants. Comprehensive, contemporary data from routine sampling and pilot testing should be gathered and assessed before making final process selections. This preliminary review serves as a basis for treatment process selection and an estimate of probable costs. There are notable characteristics of the Ute Reservoir water that will affect treatment process selection. A summary of the most relevant water characteristics (for which data was available) of the Ute Reservoir and their influence on treatment is presented in Table 5-12. The eventual intake location and capabilities will have a strong influence on the average and seasonal water quality from the Ute Reservoir.

Table 5-12. Effects of Ute Reservoir Water Quality on Treatment Process Selection.

Characteristics of the Ute Reservoir	Treatment Process Affected
High Sulfate Concentrations (150 – 325 mg/L)	Color, taste and odor removal. Corrosion control.
Moderate-High Hardness(40-270 mg/L as $CaCO_3$)	Coagulation scheme; pH control; solids production
High Alkalinity (100-200 mg/L)	Coagulant dose, DBP formation; pH control.
Neutral to Basic pH (7.7-8.9)	Pretreatment.
Moderate Total Dissolved Solids TDS (640 mg/L)	Taste and Odor removal; pretreatment requirements
Moderate – High TOC levels	Affects DBP formation; Pretreatment methods.

Smith Engineering, 2003

5.3.1.2.3 Conclusions and Recommendations, Sear Brown Report, 2002

After examining the water quality parameters of Ute Lake through testing of the proposed intake location (sampling location USLE), other lake locations, and tributaries, it is apparent that the current water quality is generally within the historical range of values. Physical, inorganic and organic chemicals, and microbiological species were monitored over a two-year period to determine the water quality at the USLE location and to evaluate the changes as well as impacts on water quality due to seasonal changes. Although seasonal changes in these parameters were noted, the raw water sampling program documented that these seasonal changes are generally within the historical range of values from previous studies.

Data from the two-year sampling program will be utilized to prepare a recommended plan for potable treatment of the Ute Lake raw water. Parameters of concern for potable treatment of the raw water are outlined below.

Physical Parameters:

- *Total Dissolved Solids (TDS)*: represents the inorganic salts in the raw water, primarily bicarbonate (alkalinity), chloride, sulfate, nitrate, sodium, potassium, calcium and magnesium. For the USLE location, the TDS ranges from 650 - 739 mg/L. A TDS of 500 mg/L is the desirable upper limit under the national secondary drinking water standards (NSDWS).

- *Hardness*: represents the total concentration of polyvalentcations present, mainly calcium (Ca) and magnesium (Mg), in the raw water. For the USLE location, the total hardness ranges from 260 – 310 mg/L. Since hardness greater than 150 mg/L is considered a factor in the scaling of hot water pipes, boilers and heaters, softening treatment *may* be required for Ute Lake water based on the high hardness and high total dissolved solids content.

Inorganic Chemical Parameters:

- *Arsenic (As)*: present in natural geological materials with weathering of the geological materials being the likely source of arsenic in the Ute Lake. For the USLE location, arsenic ranges from non-detectable (ND) – 10 µg/L with an average of 6 µg/L. The EPA has recently promulgated a revision to the arsenic maximum contaminant level (MCL) from 50 µg/L to 10 µg/L with a MCL goal of zero µg/L. Treatment *may* be required to achieve arsenic levels in the treated water that are below the revised MCL.

- *Manganese (Mn)*: present below the detection limit in the epilimnion but frequently spiked above the detection limit in the hypolimnion at the USLE location. For the USLE location, manganese ranges from ND – 0.24 mg/L with an average of 0.05 mg/L (the NSDWS level). The presence of manganese in the hypolimnion of the lake is likely due to anaerobic conditions in the bottom of the lake whereby decomposers use manganese oxide as an oxygen source. Turnover of the lake in autumn may distribute the manganese throughout the lake column requiring treatment even with the intake for the treatment plant drawing water from the epilimnion of the lake.

- *Sulfate (SO4)*: for the USLE location, sulfate ranges from 228 – 345 mg/L with an average of 291 mg/L (the NSDWS level is 250 mg/L). Sulfate concentrations were similar for both the hypolimnion and epilimnion samples. Sulfates are found as naturally occurring minerals in water and as a product of pollution sources related to mining, agriculture or industry. Since source control of sulfates is highly unlikely for the Ute Lake, treatment will be required to lower sulfate values below the NSDWS level of 250 mg/L.

Organic Chemical Parameters:

- *Total Organic Carbon (TOC)*: the USLE location TOC values ranged from 4.0 to 7.5 mg/L with an average of 4.6 mg/L. The hypolimnion and epilimnion values were similar with most of the TOC in the dissolved form (DOC). Sources of TOC include both allochthonous sources (non-point source runoff from the watershed) and autochthonous sources including algae growth. The seasonal trend of TOC values at the USLE location with TOC values in the Canadian River Inlet sample location and algae productivity in Table 3.4 indicate that both sources of TOC (allochthonous and autochthonous) are present. Source water protection measures may limit the eutrophication of the lake but will likely not reduce TOC levels below the level desired. Treatment for TOC will therefore be required to reduce TOC in the treated water specifically to prevent the formation of disinfection by-products (DBPs). Disinfection by-products are regulated for all systems with the Stage 1 Disinfectants/Disinfection By-products Rule (D/DBPR)

currently enforced and Stage 2 D/DBPR recently accepted. These rules will require surface water treatment plants to achieve certain percent reductions of TOC depending on source water quality (alkalinity and TOC levels) prior to disinfection.

Microbiological Parameters:

- *Algae/Chlorophyll/Phytoplankton*: The importance of algae can be surmised in characterizing the speciation and number of species present during different seasons in Ute Lake. A detailed limnological study would be required to fully define the ranges of influences on these species (physical, chemical, and biotic). However, the algae sampling completed during the two-year period can support the following generalizations:

  1. The increasing light in the spring and circulation of nutrient-laden water from the lower depths of the lake results in a spring "outburst" in algae species and number.
  2. The intensities of sunlight, temperature, and nutrients affect the growth of algae in Ute Lake with the highest percentages of species recorded during the summer months.
  3. Lake conditions in the spring and summer months produce significant quantities of *filter/screen clogging* and *taste and odor causing* algae.

  On a seasonal basis, therefore, algal species will need to be addressed in the treatment plan based on environmental conditions. The cycling of the algal species in Ute Lake will likely affect treatment strategies and may influence other water quality parameters.

- *Coliform*: Fecal coliforms are used as an indicator of fecal contamination or water pollution from sewage. Coliform bacteria in themselves are not harmful to humans but their presence indicates that other harmful microorganisms and pathogens may be present. Although the USLE location had <2 coliform/100 mL detected, the presence of coliform in the tributary samples suggests that the lake is subject to elevated levels from agricultural activities in the tributary watersheds. Although this is only an indicator system for monitoring, the presence of fecal counts in the 40 – 500 range for the tributaries indicates that the lake is present to some threat of fecal contamination and a variety of pathogenic organisms. The surface water treatment rule (SWTR) has been in effect since 1993 and requires that all surface waters achieve a minimum of a 3-log reduction in *Giardia* cysts and a 4-log reduction in enteric viruses. The Interim Enhanced SWTR (IESWTR) has two stages with the Long Term 1 rule currently enforced for all surface water treatment facilities and the Long Term 2 rule to be soon promulgated. These rules will improve public health protection through the control of microbial contaminants, particularly *Cryptosporidium*.

5.3.2 Groundwater

The current or potential use of Quay County's groundwater resources requires that groundwater be protected from contamination as much as possible. Groundwater contamination has already occurred in some areas of Quay County from both point sources and non-point sources.

Point sources are a major cause of groundwater pollution in Quay County, with leaking underground storage tanks (USTs) one of the most significant of these. As of December 2000, NMED had reported 39 leaking UST cases in Quay County (Table 5-13). The majority of these groundwater contamination cases are due to oil, gasoline, diesel, and petroleum constituents

such as benzene, toluene, ethyl benzene, and xylenes. The bulk of the sites are concentrated around municipal and industrial areas such as Tucumcari, Logan, San Jon and House.

Table 5-13. Leaking Underground Storage Tank Sites in Quay County

GWPA_RANK	NAME	PHYSICAL_ADDRESS	CITY	RPT_DATE
	ENMR	N HWY 54	LOGAN	5-Jun-91
194	BRYANTS CONOCO	STATE RD 39	SAN JON	14-Feb-91
214	DRIVERS TRAVEL	I 40 AND HWY 469 EXIT 356	SAN JON	29-Dec-00
66	HALLS WELL	NM 66 E OF TOWN	SAN JON	9-Sep-91
149	BAR F 11	701 E MAIN ST	TUCUMCARI	15-Nov-89
547	BAR F 13	401 W TUCUMCARI BLVD	TUCUMCARI	15-Nov-89
36	BEACON STATION 654	I 40 EXIT 321 PALOMAS INTERC	TUCUMCARI	20-Nov-92
146	CHEVRON 75762	E HWY 66	TUCUMCARI	9-Nov-84
130	CIRCLE K 839	601 E TUCUMCARI	TUCUMCARI	12-Jul-89
	CONCHAS NORTH DOCK 9	809 E MAIN	TUCUMCARI	22-Jan-99
	CONSERVANCY DISTRICT	705 W CAMPBELL ST	TUCUMCARI	11-May-90
	CONWAY OIL BULK PLAN	412 RAILROAD AVENUE	TUCUMCARI	9-Apr-93
401	CONWAY OIL BULK PLNT	412 RAILROAD AVENUE	TUCUMCARI	20-Sep-95
269	DAN C TRIGG MEM	301 E MIEL DE LUNA AVE	TUCUMCARI	18-Dec-92
	DAVIDS CONOCO	801 E MAIN	TUCUMCARI	25-Feb-00
	FIRE STATION	123 N ADAMS ST	TUCUMCARI	10-May-91
141	HOLIDAY CONOCO	I 40 AND TUCUMCARI BLVD E	TUCUMCARI	25-Nov-92
	K & C TEXACO	902 W TUCUMCARI BLVD	TUCUMCARI	13-Jun-94
	K-MART STATION	1819 E TUCUMCARI BLVD	TUCUMCARI	18-Jun-92
	KMART EXXON 2	1819 E TUCUMCARI BLVD	TUCUMCARI	16-Nov-99
671	MARTINEZ PLUMBING	1019 E MAIN	TUCUMCARI	24-Oct-91
490	NMSHTD TUCUMCARI	US HWY 54 MILE POST 305	TUCUMCARI	10-Jun-91
	QUAY COUNTY BUTANE	E TUCUMCARI BLVD	TUCUMCARI	2-Nov-93
689	RAMADA EXXON	1124 W TUCUMCARI BLVD	TUCUMCARI	10-Jul-92
761	RIGDON TEXACO	123 E TUCUMCARI BLVD	TUCUMCARI	28-Oct-93
	SECOND ST EXXON STAT	101 E TUCUMCARI BLVD	TUCUMCARI	12-Sep-96
	STUCKEY'S	I 40	TUCUMCARI	16-Jun-89
	STUCKEYS 112 A	I 40	TUCUMCARI	27-Sep-01
	SW PUBLIC SERV	301 W RAILROAD AVE	TUCUMCARI	29-Aug-89
793	TOWN & CTRY FOOD 148	201 E TUCUMCARI BLVD	TUCUMCARI	8-May-92
	TRANSCON	701 ELEVENTH ST	TUCUMCARI	10-May-91
752	TUCUMCARI CHEVRON	300 W TUCUMCARI BLVD	TUCUMCARI	11-May-98
126	TUCUMCARI CITY OF	202 N MONROE	TUCUMCARI	10-May-91
87	TUCUMCARI MUNI	6253 QUAY RD	TUCUMCARI	12-Jun-92

GWPA_RANK	NAME	PHYSICAL_ADDRESS	CITY	RPT_DATE
579	TUCUMCARI TRUCK	EXIT 329 I 40	TUCUMCARI	5-Jun-91
	UPS TUCUMCARI	524 TUCUMCARI ST	TUCUMCARI	6-Sep-91
361	WHITING BROS TUCUMCA	E TUCUMCARI BLVD	TUCUMCARI	11-Jul-89
222	WORLEY MILLS	702 W CAMBELL	TUCUMCARI	23-Jan-90
468	YOCUMS TEXACO	1823 E TUCUMCARI BLVD	TUCUMCARI	15-Mar-95
Source: NMED				

5.3.2.1 Drinking Water Standards

EPA sets standards that, when combined with protecting ground water and surface water, are critical to ensuring safe drinking water. EPA works with its regional offices, states, tribes and its many partners to protect public health through implementing the Safe Drinking Water Act. The National Drinking Water Standards are listed in Appendix C. The NMED Drinking Water Bureau's upholds the Federal Safe Drinking Water Act
and provides technical assistance, system oversight and community outreach about safe drinking water.

5.3.2.2 National Secondary Drinking Water Standards

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards. The National Secondary Drinking Water Standards are listed in Appendix C.

5.3.2.3 Tucumcari Water Quality Report

The table below lists all of the drinking water contaminants that were detected during the calendar year of the report. The presence of contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done in the calendar year of the report. The EPA or the State requires the City to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently.

Table 5-14. Tucumcari 2002 Water Quality Report

Tucumcari 2002 Water Quality Report							
				Range			
Contaminants (units)	MCLG	MCL	Your Water	Low	High	Sample Date	Violation
Inorganic Contaminants							
Arsenic (ppb)	NA	50	2.4	0.9	2.4	5/1/01	No
Barium (ppm)	2	2	0.0646	0.0347	0.0646	5/1/01	No
Chromium [Total] (ppb)	100	100	3.1	2.4	3.1	5/1/01	No
Fluoride (ppm)	4	4	1.25	0.75	1.25	5/1/01	No

Tucumcari 2002 Water Quality Report							
				Range			
Contaminants (units)	MCLG	MCL	Your Water	Low	High	Sample Date	Violation
Nitrate [measured as Nitrogen] (ppm)	10	10	4.09	1.05	4.09	----	No
Selenium (ppb)	50	50	15.5	7.5	15.5	5/1/01	No
Sodium (ppm)	MNR	MNR	186	NA		6/3/97	No
Alpha emitters (pCi/L)	0	15	5.03	0.91	5.03	----	No
Beta/photon emitters (pCi/L) (pCi/L)	NA	NA	13.2	NA	----		No
Combined Radium 226/228 (pCi/L)	0	5	0.14	0.14	0.14	----	No
Unregulated Contaminants							
Bromoform (ppb)	NA	NA	2.5	NA	NA	2/26/00	No
Chlorodibromomethane (ppb)	NA	NA	1.3	NA	NA	2/26/00	No
Sulfate (ppm)	NA	NA	408	NA	NA	8/12/97	No
Inorganic Contaminants							
Copper ()	1.3	1.3	0.0852	0	6/11/00		No
Lead (ppb)	0	15	2	0	6/11/00		No
Units Description:							
NA: Not applicable							
ND: Not detected							
NR: Not reported							
MNR: Monitoring not required, but recommended.							
ppm: parts per million, or milligrams per liter (mg/L)							
ppb: parts per billion, or micrograms per liter (µg/L)							
pCi/L: picocuries per liter (a measure of radioactivity)							
Important Drinking Water Definitions:							
MCLG: Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.							
MCL: Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.							
AL: Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.							
MRDLG: Maximum residual disinfection level goal. The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.							
MRDL: Maximum residual disinfectant level. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.							

5.3.2.4 Logan Water Quality Report

Table 5-13 below lists all of the drinking water contaminants that were detected during the calendar year of the report. The presence of contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done in the calendar year of the report. The EPA or the State requires the City to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently.

Table 5-15. Logan 2002 Water Quality Report

LOGAN 2002 WATER QUALITY REPORT						
TEST RESULTS						
Contaminant	Violation	Level	Date	Range of Detection	Maximum Contaminant Level (MCLG)	Maximum Contaminant Level (MCL)
(Unit Measurement)	Y/N	Detected	Tested			
Microbiological Contaminants Tested Every Month						
1. Total Coliform Bacteria	N	ND			0	presence of coliform bacteria in 5% of monthly samples
2. Fecal coliform and *E.coli*	N	ND			0	a routine sample and repeat sample are total coliform positive, and one is also fecal coliform or *E. coli* positive
Turbidity						
3. Turbidity	N	0.01	Dec-97	NTU	N/a	TT
Radioactive Contaminants						
4. Beta/photon emitters	N	NA			0	50
5. Alpha emitters (pCi/1)	N	1.7	Jul-99	Pci/L	0	15
6. Combined radium (pCi/1)	N	0.11	Jun-99	Pci/L	0	5
Inorganic Contaminants						
7. Antimony (ppb)	N	ND	3-Mar	Ppb	6	6
8. Arsenic (ppb)	N	1.4	3-Mar	Ppb	N/a	50
9. Asbestos (MFL)	N	Waiver 94-2003		MFL	7	7
10. Barium (ppm)	N	33.9	3-Mar	Ugl	2	2

LOGAN 2002 WATER QUALITY REPORT						
TEST RESULTS						
Contaminant (Unit Measurement)	Violation Y/N	Level Detected	Date Tested	Range of Detection	Maximum Contaminant Level (MCLG)	Maximum Contaminant Level (MCL)
11. Beryllium (ppb)	N	ND	Oct-98	Ppb	4	4
12. Cadmium (ppb)	N	ND	3-Mar	Ppb	5	5
13. Chromium (ppb)	N	5.2	3-Mar	Ppb	100	100
14. Copper (ppm)	N	0.144	Nov-96	Ugl	1.3	AL=1.3
15. Cyanide (ppb)	N	<0.005	3-Feb	Ppm	200	200
16. Fluoride (ppm)	LT	0.3	3-Mar	Ppm	4	4
17. Lead (ppb)	N	1.1	Nov-96	Ppb	0	AL=15
18. Mercury (inorganic)	N	ND	3-Mar	Ppb	2	2
19. Nitrate (as Nitrogen) (ppm)	N	0.75	3-Mar	Mg/l	10	10
20. Nitrite (as Nitrogen)	N	<.004	Nov-93	Ppm	1	1
21. Selenium	N	5.27	3-Mar	Mg/l	50	50
22. Thallium (ppb)	N	5.02	3-Mar	Ugl	0.5	2

Non-Detects (ND)

Parts per million (ppm) or Milligrams per liter (mg/l)

Parts per billion (ppb) or Micrograms per liter

Parts per trillion (ppt) or Nanograms per liter (nanograms/l)

Parts per quadrillion (ppq) or Picograms per liter (picograms/l)

Picocuries per liter (pCi/L) - picocuries per liter is a measure of the radioactivity in water.

Millirems per year (mrem/yr) - measure of radiation absorbed by the body.

Million Fibers per Liter (MFL) - million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.

Nephelometric Turbidity Unit (NTU) - nephelometric turbidity unit is a measure of the clarity of water.

Variances & Exemptions (V&E) - State or EPA permission not to meet an MCL or a treatment technique under certain conditions.

Action Level - the concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

Treatment Technique (TT) - (mandatory language) A treatment technique is a required process intended to reduce the level of a contaminant in drinking water.

LOGAN 2002 WATER QUALITY REPORT						
TEST RESULTS						
Contaminant	Violation	Level	Date	Range of Detection	Maximum Contaminant Level (MCLG)	Maximum Contaminant Level (MCL)
(Unit Measurement)	Y/N	Detected	Tested			
Maximum Contaminant Level - (mandatory language) The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.						
Maximum Contaminant Level Goal - (mandatory language) The "Goal"(MCLG) is the level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLGs allow for a margin of safety.						

5.3.2.5 San Jon Water Quality Report

Table 5-16 below lists all of the drinking water contaminants that were detected during the calendar year of the report. The presence of contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done in the calendar year of the report. The EPA or the State requires the City to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently.

Table 5-16. San Jon 2002 Water Quality Report

San Jon 2002 Water Quality Report							
				Range			
Contaminants (units)	MCLG	MCL	Your Water	Low	High	Sample Date	Violation
Inorganic Contaminants							
Arsenic (ppb)	NA	50	31.8	NA	NA	----	No
Barium (ppm)	2	2	0.0669	NA	NA	----	No
Chromium [Total] (ppb)	100	100	13.6	NA	NA	----	No
Fluoride (ppm)	4	4	4.68	2.83	4.68	----	No
Nickel (ppb)	MNR	MNR	0.44	NA			No
Nitrate [measured as Nitrogen] (ppm)	10	10	4.50	2.28	4.50	----	No
Selenium (ppb)	50	50	12.2	NA	NA	----	No
Thallium (ppb)	0.5	2	0.12	NA	NA	----	No
Radioactive Contaminants							
Alpha emitters (pCi/L)	0	15	11.65	NA	NA	----	No

Beta/photon emitters (pCi/L)	NA	NA	0.00	NA	NA	----	No
Unregulated Contaminants							
Bromoform (ppb)	NA	NA	2.5	NA	NA	----	No
Chlorodibromomethane (ppb)	NA	NA	1.3	NA	NA	----	No
Sulfate (ppm)	NA	NA	408	NA	NA	----	No
Contaminant(s) (units)	MCLG	Allowable Limit (AL)	Your Water	# of Samples > AL	Sample Date		Exceeds AL
Inorganic Contaminants							
Copper ()	1.3	1.3	0.144	0	----		No
Lead (ppb)	0	15	1.3	0	----		No
Units Description:							
NA: Not applicable							
ND: Not detected							
NR: Not reported							
MNR: Monitoring not required, but recommended.							
ppm: parts per million, or milligrams per liter (mg/L)							
ppb: parts per billion, or micrograms per liter (µg/L)							
pCi/L: picocuries per liter (a measure of radioactivity)							
Important Drinking Water Definitions:							
MCLG: Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.							
MCL: Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.							
AL: Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.							
MRDLG: Maximum residual disinfection level goal. The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.							
MRDL: Maximum residual disinfectant level. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.							

5.3.2.6 House Water Quality Report

Table 5-17 below lists the drinking water contaminants that were detected or reported by the Village of House. The presence of contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done in the calendar year of the report. The EPA or the State requires the City to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently.

Table 5-17. House Water Quality

HOUSE WATER QUALITY						
TEST RESULTS						
Contaminant	Violation	Level	Date	Range of Detection	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level (MCL)
Unit Measurement	Y/N	Detected	Tested			
Microbiological Contaminants Tested Every Month						
Total Coliform Bacteria	N	ND			0	presence of coliform bacteria in 5% of monthly samples
Fecal coliform and *E.coli*	N	ND			0	a routine sample and repeat sample are total coliform positive, and one is also fecal coliform or *E. coli* positive
Turbidity						
Turbidity	N	0.26	5/5/97	NTU	N/a	TT
Radioactive Contaminants						
Beta/photon emitters	N	7.5	1/1/00	Pci/L	0	50
Alpha emitters (pCi/1)	N	2.3	1/1/00	Pci/L	0	15
Combined radium (pCi/1)	N	0.02	1/1/00	Pci/L	0	5
Inorganic Contaminants						
Antimony (ppb)	N	ND	3/10/03	Ppb	6	6
Arsenic (ppb)	N	7.5	3/10/03	Ppb	N/a	50
Asbestos (MFL)	N	Waiver		MFL	7	7
Barium (ppm)	N	31.7	3/10/03	Ugl	2	2
Beryllium (ppb)	N	ND	3/10/03	Ppb	4	4
Cadmium (ppb)	N	ND	3/10/03	Ppb	5	5
Chromium (ppb)	N	1.0	3/10/03	Ppb	100	100
Copper (ppm)	N	0.012	Nov-95	Ugl	1.3	AL=1.3
Cyanide (ppb)	N	ND	3/1/03	Ppm	200	200

HOUSE WATER QUALITY TEST RESULTS						
Contaminant	Violation	Level	Date	Range of Detection	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level (MCL)
Unit Measurement	Y/N	Detected	Tested			
Fluoride (ppm)	LT	1.04	3/11/03	Ppm	4	4
Lead (ppb)	N	0.47	Nov-95	Ppb	0	AL=15
Mercury (inorganic)	N	ND	3/10/03	Ppb	2	2
Nickel	N	3.19	3/10/03	Ppb		
Nitrate (as Nitrogen) (mg/l)	N	3.51	2/17/03	Mg/l	10	10
Nitrite (as Nitrogen)	N	<.004	Nov-93	Ppm	1	1
Selenium	N	10.9	3/10/03	Mg/l	50	50
Thallium (ppb)	N	ND	3/10/03	Ugl	0.5	2
SOC's		ND	1/7/00	Ugl		
VOC's		ND	3/03/03	Ugl		

Non-Detects (ND)

Parts per million (ppm) or Milligrams per liter (mg/l)

Parts per billion (ppb) or Micrograms per liter

Parts per trillion (ppt) or Nanograms per liter (nanograms/l)

Parts per quadrillion (ppq) or Picograms per liter (picograms/l)

Picocuries per liter (pCi/L) - picocuries per liter is a measure of the radioactivity in water.

Millirems per year (mrem/yr) - measure of radiation absorbed by the body.

Million Fibers per Liter (MFL) - million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.

Nephelometric Turbidity Unit (NTU) - nephelometric turbidity unit is a measure of the clarity of water.

Variances & Exemptions (V&E) - State or EPA permission not to meet an MCL or a treatment technique under certain conditions.

Action Level - the concentration of a contaminant, which, if exceeded, triggers treatment or other requirements, which a water system must follow.

Treatment Technique (TT) - (mandatory language) A treatment technique is a required process intended to reduce the level of a contaminant in drinking water.

Maximum Contaminant Level - (mandatory language) The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal - (mandatory language) The "Goal"(MCLG) is the level of a contaminant in drinking water below, which there is no known or expected risk to health. MCLGs allow for a margin of safety.

5.4 Summary of Water Supply Considering Legal Constraints

The Water Supply As discussed in Section 4, federal and state laws and water rights issues raise no obstacles to pursuing the alternatives and objectives of the *Quay County Regional Water Plan,* although local governments implementing various aspects of the plan will be required to follow legal requirements, such as permitting. The primary issues regarding legal access to the water supply in Quay County are the Canadian River Compact and the New Mexico system of water appropriations (water rights). The water quality of the municipal systems meets Federal and State Standards. The use of surface water from Ute Lake will require treatment to meet drinking water standards.

Section 6 - Water Demand

6. Water Demand

Sections 6.1 through 6.3 addresses present water demands, projected future water uses, and water conservation measures that can be used to help reduce future demands.

6.1 Present Uses

Present and historical water use was determined primarily based on information from the OSE, which tracks water used in New Mexico in several categories: public water supply and self supplied domestic, irrigated agriculture, self-supplied livestock, self-supplied commercial, industrial, mining, power, and reservoir evaporation. Table 6-1 shows water use in each category for the years 1975, 1980, 1985, 1990, 1995, and 2000 based on the OSE inventories for those years (Sorensen, 1976; Sorensen, 1981; Wilson, 1986; Wilson, 1992; Wilson and Lucero, 1997, Wilson, 2002). Over the years, the OSE has made a few changes in the way that water demand is categorized and reported, including:

- Fish and wildlife and recreation were previously (1975 through 1985) reported as separate categories but are now included in the commercial category.
- Rural, urban, and military uses were separate categories until 1990, when they were replaced with the public water supply and self-supplied domestic categories.
- The OSE stopped reporting stock pond evaporation (which was previously a separate category) after 1985.
- The OSE water use data include only the amount of water that is used by people or is indirectly used through a man-made structure (i.e., reservoir evaporation) and thus does not include natural riparian consumption.

Figure 6-1. Total Withdrawals by Category in Quay County

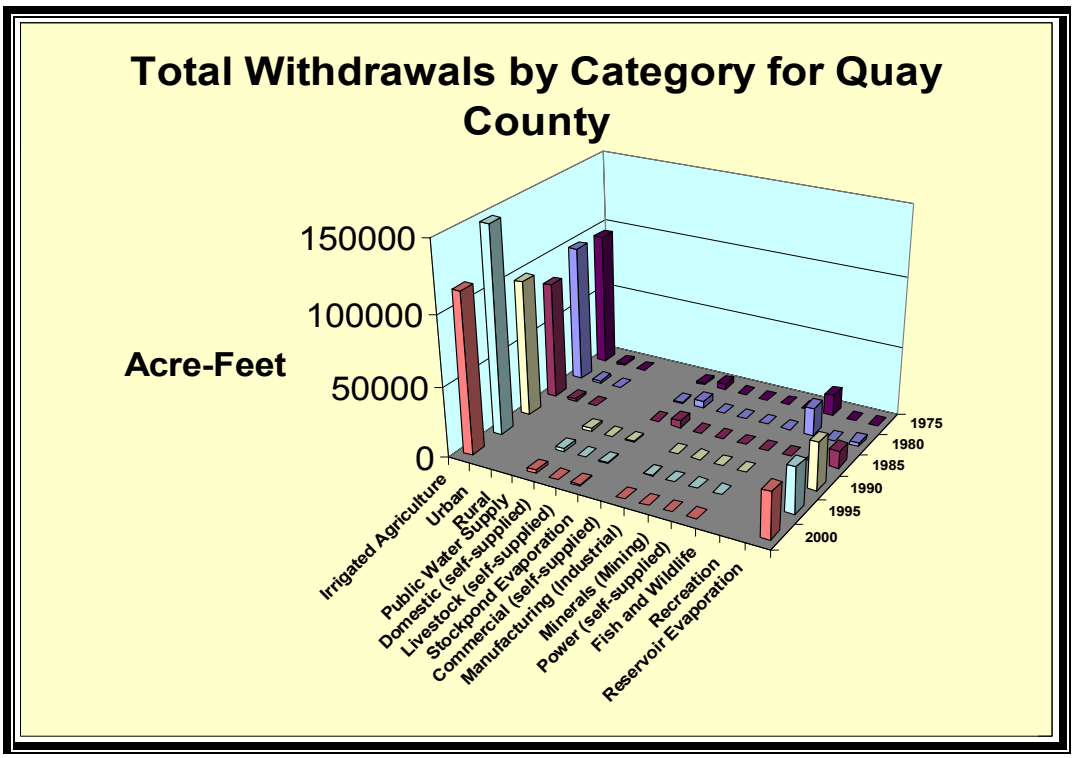


Table 6-1. Quay County Water Use, 1990 Through 2000

	Withdrawal		Depletion		Return Flow		Totals		
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Withdraw	Depletio	Return Flow
1975									
Urban	0	1706	0	768	0	938	1706	768	938
Rural	0	230	0	115	0	115	230	115	115
Public Water Supply									
Domestic (self-supplied)									
Irrigated Agriculture	60740	34860	21570	18450	39170	16410	95600	40020	55580
Livestock (self-supplied)	634	634	634	634	0	0	1268	1268	0
Stock pond Evaporation	4246	0	4246	0	0	0	4246	4246	0
Commercial (self-supplied)	0	0	0	0	0	0	0	0	0
Industrial (self-supplied)	0	43	0	26	0	17	43	26	17
Minerals	0	0	0	0	0	0	0	0	0
Power (self-supplied)	0	17	0	17	0	0	17	17	0
Fish and Wildlife	15300	0	15300	0	0	0	15300	15300	0
Recreation	0	0	0	0	0	0	0	0	0
Reservoir Evaporation	500	0	500	0	0	0	500	500	0
TOTAL:	81420	37490	42250	20010	39170	17480	118910	62260	56650
1980									
Urban	0	1720	0	774	0	946	1720	774	946
Rural	0	305	0	153	0	152	305	153	152
Public Water Supply									
Domestic (self-supplied)									
Irrigated Agriculture	72750	25110	27510	15830	45240	9280	97860	43340	54520
Livestock (self-supplied)	327	338	327	336	0	2	665	663	2
Stock pond Evaporation	5292	0	5292	0	0	0	5292	5292	0
Commercial (self-supplied)	0	0	0	0	0	0	0	0	0
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0

	Withdrawal		Depletion		Return Flow		Totals		
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Withdraw	Depletio	Return Flow
Mining (self-supplied)	0	3	0	1	0	2	3	1	2
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Fish and Wildlife	20000	0	20000	0	0	0	20000	20000	0
Recreation	75	0	69	0	6	0	75	69	6
Reservoir Evaporation	2959	0	2959		0	0	2959	2959	0
TOTAL:	101403	27476	56157	17094	45246	10382	128879	73251	55628
1985									
Urban	0	1807	0	813	0	994	1807	813	994
Rural	0	427	0	214	0	213	427	214	213
Public Water Supply									
Domestic (self-supplied)									
Irrigated Agriculture	68810	14369	19358	8872	49452	5497	83179	28230	54949
Livestock (self-supplied)	333	345	333	343	0	2	678	676	2
Stock pond Evaporation	5292	0	5292	0	0	0	5292	5292	0
Commercial (self-supplied)	0	0	0	0	0	0	0	0	0
Industrial (self-supplied)	0	11	0	6	0	5	11	6	5
Minerals	0	12	0	2	0	10	12	2	10
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Fish and Wildlife	0	0	0	0	0	0	0	0	0
Recreation	98	15	64	15	34	0	113	79	34
Reservoir Evaporation	12381	0	12381	0	0	0	12381	12381	0
TOTAL:	86914	16986	37428	10265	49486	6721	103900	47693	56207
1990									
Urban									
Rural									
Public Water Supply	81	1971	70	968	11	1003	2052	1038	1014
Domestic (self-supplied)	0	155	0	70	0	85	155	70	85
Irrigated Agriculture	78484	18586	31161	14721	47323	3865	97070	45882	51188

	Withdrawal		Depletion		Return Flow		Totals		
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Withdraw	Depletio	Return Flow
Livestock (self-supplied)	68	652	68	650	0	2	720	718	2
Stock pond Evaporation									
Commercial (self-supplied)	0	7	0	3	0	4	7	3	4
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0
Mining (self-supplied)	0	2	0	0	0	2	2	0	2
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Fish and Wildlife									
Recreation									
Reservoir Evaporation	34055	0	34055	0	0	0	34055	34055	0
TOTAL:	112688	21373	65354	16412	47334	4961	134061	81766	52295
1995									
Urban									
Rural									
Public Water Supply	81	2060	70	996	11	1064	2141	1066	1075
Domestic (self-supplied)	0	139	0	63	0	76	139	63	76
Irrigated Agriculture	119333	28023	40077	21387	79256	6636	147356	61464	85892
Livestock (self-supplied)	72	660	72	660	0	0	732	732	0
Stock pond Evaporation									
Commercial (self-supplied)	0	11	0	5	0	6	11	5	6
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0
Mining (self-supplied)	0	0	0	0	0	0	0	0	0
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Fish and Wildlife									
Recreation									
Reservoir Evaporation	32938	0	32938	0	0	0	32938	32938	0
TOTAL:	152424	30893	73157	23111	79267	7782	183317	96268	87049
2000									
Urban									

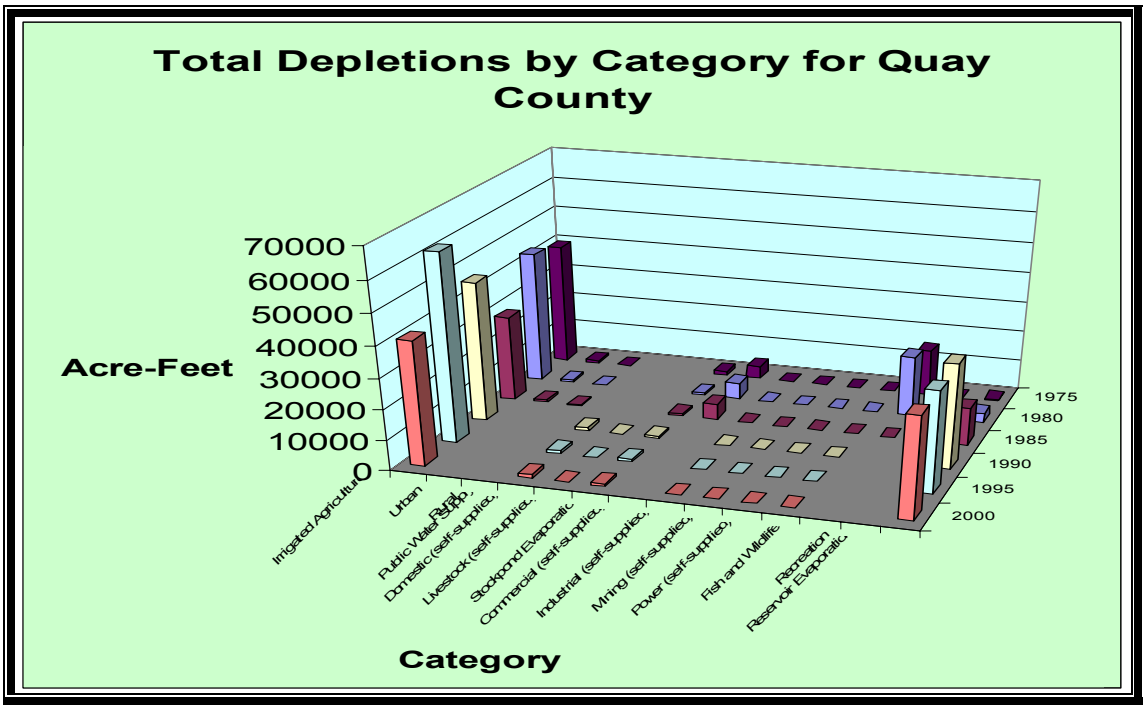
	Withdrawal		Depletion		Return Flow		Totals		
	Surface Water	Ground Water	Surface Water	Ground Water	Surface Water	Ground Water	Withdraw	Depletio	Return Flow
Rural									
Public Water Supply	0.00	2172	0.00	1256	0.00	917	2172	1256	917
Domestic (self-supplied)	0	138	0	138	0	0	138	11	0
Irrigated Agriculture	107954	6546	34912	5523	73042	1023	114500	40435	74065
Livestock (self-supplied)	87	792	87	792	0.00	0.00	878	878	0
Stock pond Evaporation									
Commercial (self-supplied)	0	11	0	11	0	0	11	11	0
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0
Mining (self-supplied)	0	0	0	0	0	0	0	0	0
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Fish and Wildlife									
Recreation									
Reservoir Evaporation	32938	0	32938	0	0	0	32938	32938	0
TOTAL:	140979	9659	67937	7719	73042	1940	150638	75656	74982

SOURCE: OSE

Note; For water years 1985, 1980, and 1975, no return flow was reported by the OSE. The number shown here for these years is the potential return flow, calculated by subtracting the depletion from the withdrawal.

Figure 6-2 shows the total amount of water depleted, or consumptively used, in each category, that is, the amount of withdrawal minus any return flow.

Figure 6-2. Total Depletions by Category in Quay County



6.1.1 Public Water Supply and Self-Supplied Domestic

These two OSE categories include domestic use from both public water supplies that serve whole communities and private domestic wells that serve only one or a few residences. These two types of domestic use are discussed in Sections 6.1.1.1 and 6.1.1.2.

6.1.1.1 Public Water Supply

This category includes community water systems that rely upon surface water and/or groundwater diversions other than private domestic wells and that consist of common collection, treatment, storage, and distribution facilities operated for the delivery of water to multiple service connections (Wilson and Lucero, 1997). Water used for the irrigation of self-supplied golf courses, playing fields, and parks, or water used to maintain the water level in ponds and lakes owned and operated by a municipality or water utility is also included in this category. Inclusion of these uses allows comparison of the total amount of water used by the system to the water rights owned by these public water suppliers.

Table 6-2. Community Water Systems

Community Water Systems: **Water Systems that serve the same people year-round (e.g. in homes or businesses).**						
Water System Name	**Principal County Served**	**Population Served**	**Primary Water Source Type**	**System Status**	**Date Closed**	**Water System ID**
HOUSE WATER SYSTEM	**QUAY**	**69**	**Ground water**	**Active**		**NM3510220**
LOGAN WATER SYSTEM	**QUAY**	**960**	**Ground water**	**Active**		**NM3526920**
NARA VISA WATER CO-OP	**QUAY**	**140**	**Ground water**	**Active**		**NM3535320**
SAN JON WATER SUPPLY	**QUAY**	**287**	**Ground water**	**Active**		**NM3527920**
TUCUMCARI WATER SYSTEM	**QUAY**	**7150**	**Ground water**	**Active**		**NM3528020**
HILL'S VILLAGE WATER SYSTEM	**QUAY**	**102**	**Purchased ground water from City of Tucumcari**	**Closed**		**NM3510120**
LIBERTY MDWCA	**QUAY**	**225**	**Purchased ground water from City of Tucumcari**	**Closed**		**NM3510020**
RAD WATER USERS COOP.	**QUAY**	**470**	**Purchased ground water from City of Tucumcari**	**Closed**		**NM3564420**
Non-Transient Non-Community Water Systems: **Water Systems that serve the same people, but not year-round (e.g. schools that have their own water system).**						
Water System Name	**Principal County Served**	**Population Served**	**Primary Water Source Type**	**System Status**	**Date Closed**	**Water System ID**
NORTH DOCK TRAILER COURT	**QUAY**	**125**	**Ground water**	**Closed**	**2/1/1994**	**NM3590620**
Transient Non-Community Water Systems: **Water Systems that do not consistently serve the same people (e.g. rest stops, campgrounds, and gas stations).**						
Water System Name	**Principal County Served**	**Population Served**	**Primary Water Source Type**	**System Status**	**Date Closed**	**Water System ID**
GLENRIO HIGHWAY REST AREA	**QUAY**	**550**	**Ground water**	**Active**		**NM3590020**
STUCKEYS #112	**QUAY**	**400**	**Ground water**	**Active**		**NM3590320**
BEACON BINGO WATER SYSTEM	**QUAY**	**75**	**Ground water**	**Closed**	**2/1/1994**	**NM3593120**
CAPROCK AMPHITHEATER	**QUAY**	**25**	**Ground water**	**Closed**	**1/1/1995**	**NM3593020**
SOURCE: EPA						

Table 6-3. Municipal Water Wells in Quay County

MUNICIPAL WATER SUPPLY WELLS IN QUAY COUNTY					
WELL DESCRIPTION	OSE PERMIT NUMBER	USE	Acre-Feet	DEPTH	CAPACITY
CITY OF TUCUMCARI					
Well # 1	TU 00017	MUN	160	390	160
Well # 2	TU 00016	MUN	155	330	182
Well #3	TU 00035	MUN	125	305	110
Well # 4	TU 00031	MUN	97	332	140
Well # 5	TU 00030	MUN	194	370	115
Well # 6	TU 00029	MUN	145	385	160
Well # 7	TU 00027	MUN	155	390	170
Well # 8	TU 00028	MUN	155	330	185
Well # 10	TU 00033	MUN	194	315	260
Well #11	TU 00025	MUN	300	360	
Well # 12	TU 00024	MUN	300	305	410
Well # 13	TU 00020	MUN	402	300	405
Well #14	TU 00021	MUN	300		
Well # 15	TU 00034	MUN	145	262	160
Well # 16	TU 00018	MUN	291	326	265
Well # 17	TU 00019	MUN	291	336	315
Well # 18	TU 00026	MUN	436	179	500
Well # 19	TU 00022	DEC	388	331	400
Well # 20	TU 00023	MUN	155	380	
Golf Course	TU 01257	IRR	32		
Well # 4	TU 00032	MUN	300		
Well # 6	TU 00010	DOM	0	320	200
Total Acre-Feet Declared by Tucumcari			4720		
VILLAGE OF LOGAN					
Well # 1	TU 01329	MUN	119	335	200
Well # 2)	TU 01328	MUN	46	254	90
Well # 3	TU 01326	MUN	29.8	315	100
Well # 4	TU 01327	MUN	65	205	50
Well # 5	TU 01325	MUN	125	290	250
Well # 6	TU 01331	MUN	150	340	270
Well #7	TU 01330	MUN	250	290	200
Well # 8	TU 01179	IRR	223	315	100
Total Acre-Feet Declared by Logan			1007.8		
VILLAGE OF SAN JON					
Well # 1	TU 01209	MUN	17.7	UNKNOWN	11
Well # 2	TU 01210	MDW	16.1	UNKNOWN	10
Well # 3	TU 01211	MUN	17.7	UNKNOWN	9
Well # 4	TU 01212	MUN	16.1	UNKNOWN	10

MUNICIPAL WATER SUPPLY WELLS IN QUAY COUNTY					
WELL DESCRIPTION	OSE PERMIT NUMBER	USE	Acre-Feet	DEPTH	CAPACITY
Well # 20	TU 01217	MUN	17.7	155	11
Well # 21	TU 01213	MUN	22.6	220	14
Well # 22	TU 01214	MUN	35.5	88	35
Well # 23	TU 01215	MUN	9.2	102	8
Well # 24	TU 01216	MUN	8.0	86	7
Total Acre-Feet Declared by San Jon			160.6		
VILLAGE OF HOUSE					
Well # 1	FS-1129	Mun	250	110	400
SOURCE:OFFICE OF THE STATE ENGINEER					

Information on Quay County public water systems was compiled from the communities themselves. As indicated on this table, there are 6 public water systems in Quay County producing a total of about 3 million gallons per day (mgd). The Nara Visa Water Cooperative and the Forrest Community Water System are not within a declared water basin and therefore are not included in the OSE database.

A summary of water production by county municipalities only is presented in Table 6-4. Information on monthly water use by each municipality, which aids in preparing for seasonal variability, is shown on Figures 6-4 through 6-9. These figures illustrate that most of the municipalities show increased use in the summer months, corresponding to increased outdoor watering as well as increased tourism in some locations.

Figure 6-3. Municipal Water Production

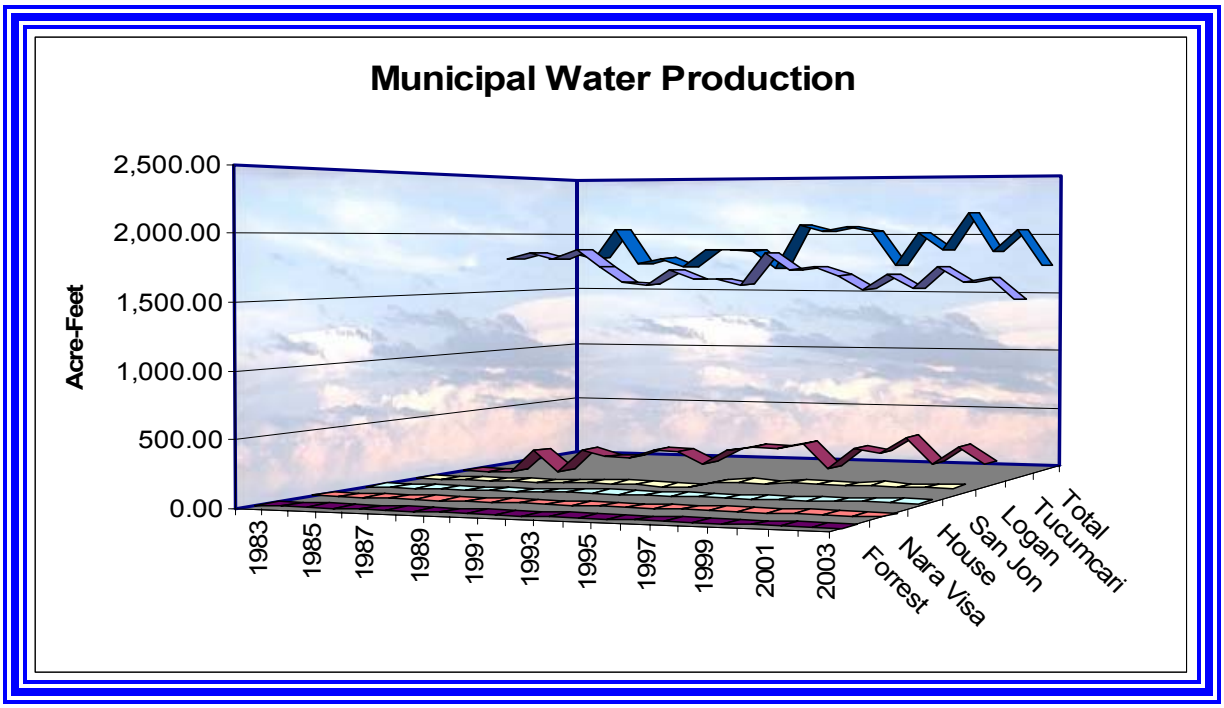


Table 6-4. Municipal Water Production 1984-2003

Water Production (Acre-Feet)					
	2003	2002	2001	2000	1999
Tucumcari	1,465.21	1,646.54	1,603.50	1,725.40	1,552.83
Logan	189.22	310.80	167.35	377.13	247.66
San Jon	64.51	60.70	58.75	66.62	55.61
House	37.94	24.20	21.09	13.86	12.96
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	1,756.87	2,042.24	1,850.70	2,183.00	1,869.06
	1998	1997	1996	1995	1994
Tucumcari	1,665.89	1,543.13	1,654.31	1,726.14	1,698.66
Logan	276.37	112.87	305.87	266.29	268.12
San Jon	64.19	63.77	48.97	58.20	46.18
House	10.47	10.38	11.15	13.79	12.89
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	2,016.93	1,730.15	2,020.30	2,064.41	2,025.85
	1993	1992	1991	1990	1989
Tucumcari	1,840.42	1,575.29	1,619.20	1,619.93	1,696.77
Logan	231.33	112.40	214.10	217.42	147.09
San Jon	0.00	0.00	12.49	11.04	8.67
House	9.07	11.45	12.49	11.04	8.67
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	2,080.82	1,699.13	1,858.28	1,859.44	1,861.20
	1988	1987	1986	1985	1984
Tucumcari	1,565.79	1,584.17	1,714.28	1,865.30	1,787.15
Logan	148.78	203.74	19.98	183.62	0.00
San Jon	1.22	0.00	0.00	0.00	0.00
House	1.22	0.00	0.00	0.00	0.00
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	1,717.02	1,787.91	1,734.26	2,048.92	1,787.15

Figure 6-4 Through 6-9. Average Water Use by Month per Municipality/Community

Figure 6-4

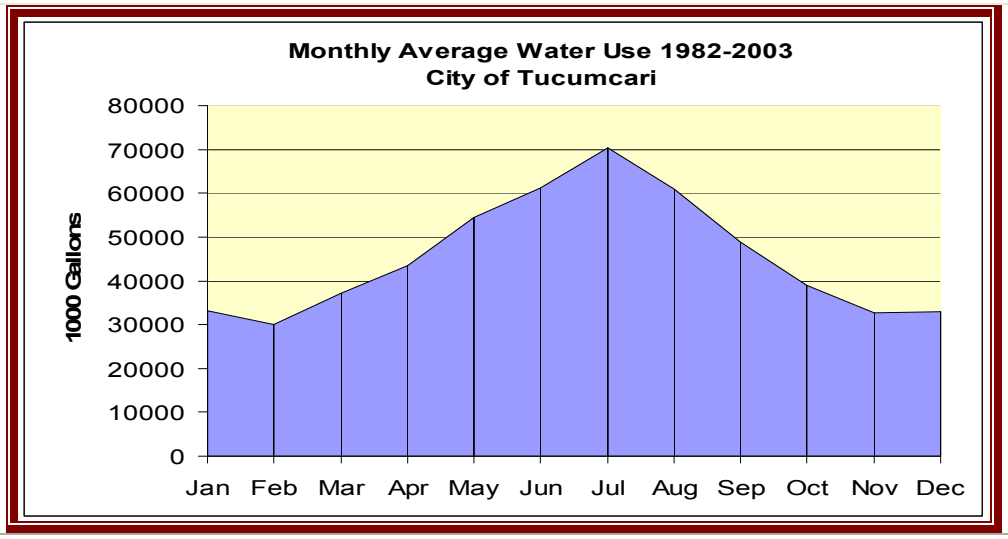


Figure 6-5

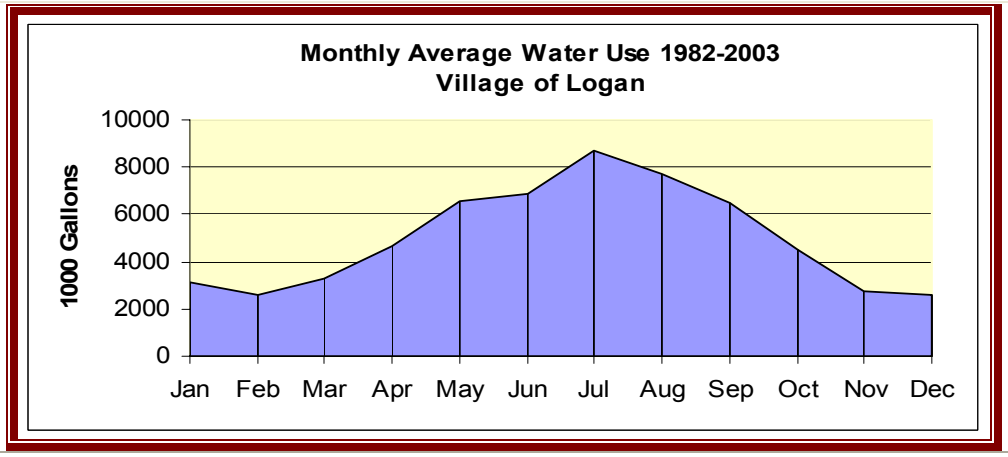


Figure 6-6

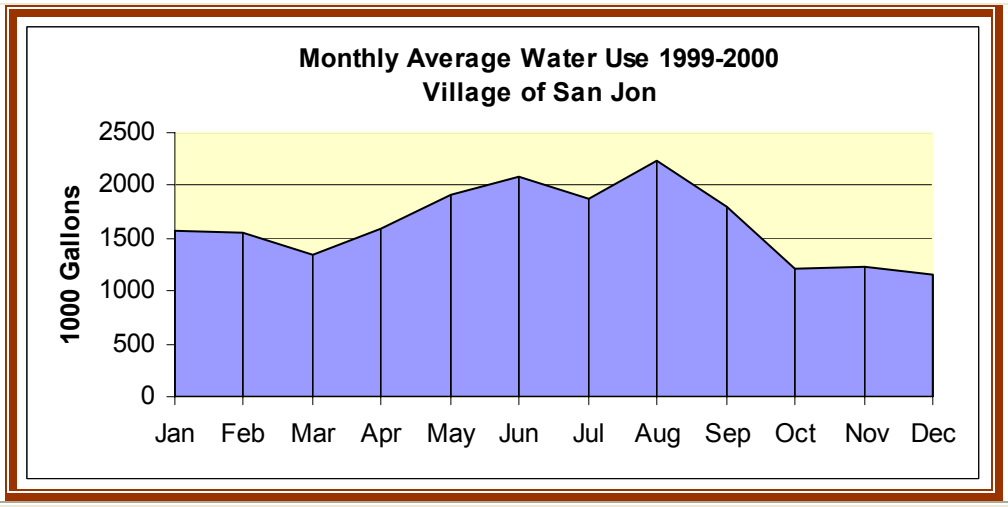


Figure 6-7

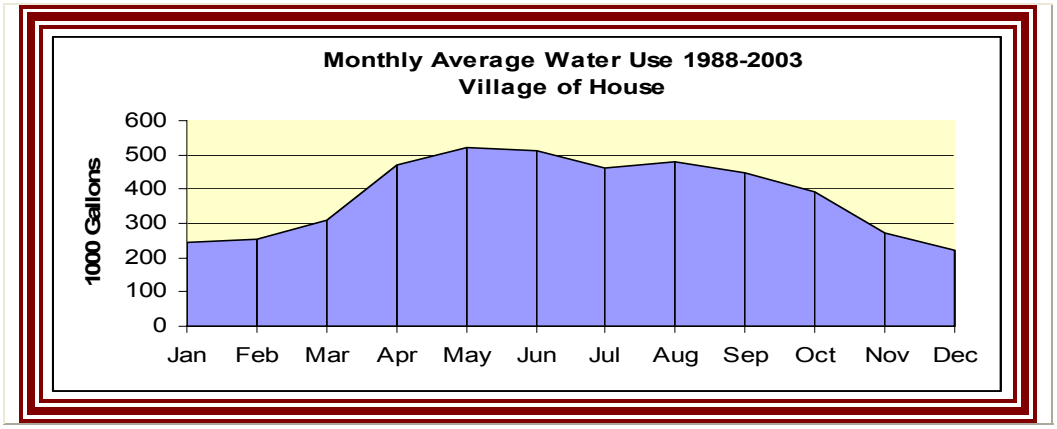
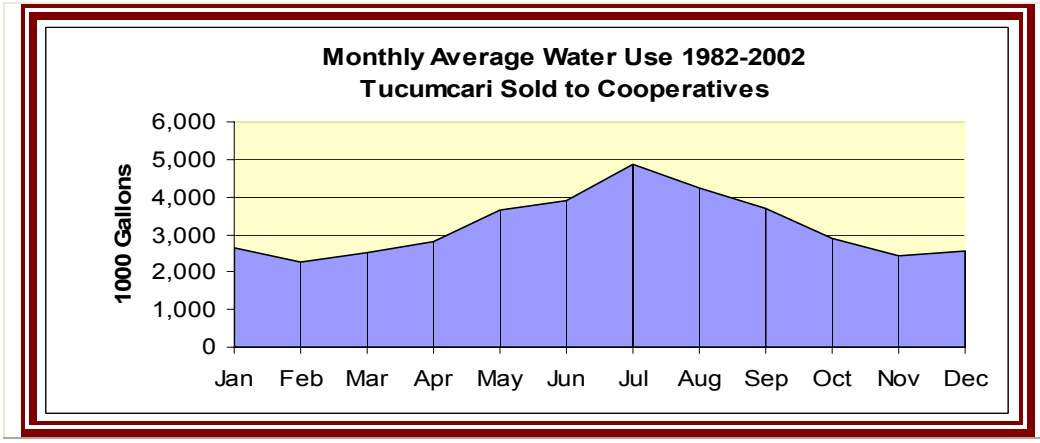


Figure 6-8



6.1.1.2 Self-Supplied Domestic Wells

This category includes self-supplied residences, which may be single family dwellings or multifamily dwellings, with wells permitted by the OSE under NMSA Section 72-12-1 (Appendix D). The OSE Water Administration Technical Engineering Resource System (WATERS) database lists 871 domestic wells in Quay County.

The OSE indicates total withdrawals of 138.27 acre-feet for the self-supplied domestic well category in 2000 (Table 6-1). This estimate was based on the procedure defined by Wilson and Lucero (1997), which is to subtract the population served by public water supply systems from the total county population. However, since domestic wells are not metered, this is only an estimate of domestic well use.

6.1.2 Irrigated Agriculture

Irrigated agriculture is the largest water use in Quay County. Wilson and Lucero (1997) define irrigated agriculture as including all diversions of water for the irrigation of crops grown on farms, ranches, and wildlife refuges. In the Quay County, irrigated agriculture relies primarily on surface water supplies (Table 6-1). Agricultural demand for both withdrawals and consumptive use are not directly measured, but are instead estimated based on a model of crop water needs. Agricultural consumptive (depletion) use and withdrawal estimates reported by the OSE (Sorenson, 1976, 1981; Wilson, 1986, 1992; Wilson and Lucero, 1997, 2003) are summarized in Tables 6-1.

The historic diversion, delivery, and efficiency of the Tucumcari Project, Arch Hurley Conservancy District is reflected in Table 6-5.

Table 6-5. Arch Hurley Conservancy District Water Usage 1946-2003

Arch Hurley Conservancy District Water Usage 1946-2003						
Year	Water Released (Acre-Feet)	Water Delivered (Acre-Feet)	Delivery Efficiency	Total Acres Irrigated	Average Delivery per Acre (Acre-Feet)	Allocation (inches)
1946	NR	NR	NR	2527		
1947	38,000	11,119	29.26%	4563	2.44	
1948	81,167	22,818	28.11%	16069	1.42	
1949	78,389	27,462	35.03%	22510	1.22	
1950	106,611	45,451	42.63%	31563	1.44	
1951	128,111	61,305	47.85%	33318	1.84	
1952	132,960	67,064	50.44%	33755	1.99	
1953	87,345	42,792	48.99%	35783	1.20	
1954	64,559	39,216	60.74%	29440	1.33	
1955	86,859	50,807	58.49%	33616	1.51	
1956	105,326	58,909	55.93%	33140	1.78	
1957	84,897	47,824	56.33%	33615	1.42	
1958	79,528	36,259	45.59%	33554	1.08	
1959	102,746	51,981	50.59%	33727	1.54	12
1960	62,200	29,041	46.69%	31854	0.91	18
1961	82,998	46,013	55.44%	34398	1.34	24
1962	117,962	68,110	57.74%	34532	1.97	24
1963	113,613	64,187	56.50%	36540	1.76	24
1964	79,166	40,860	51.61%	32668	1.25	13
1965	78,894	42,851	54.31%	33714	1.27	36
1966	105,532	61,939	58.69%	35559	1.74	48
1967	99,131	55,741	56.23%	37588	1.48	36
1968	113,467	63,841	56.26%	37688	1.69	48
1969	80,444	43,244	53.76%	36300	1.19	48
1970	91,402	53,427	58.45%	35283	1.51	36
1971	96,926	56,435	58.22%	34822	1.62	24
1972	69,382	37,567	54.15%	33177	1.13	18
1973	94,863	55,778	58.80%	36353	1.53	36
1974	115,751	69,512	60.05%	35542	1.96	24
1975	60,738	32,052	52.77%	33752	0.95	9
1976	20,780	9,065	43.62%	35086	0.26	1
1977	38,103	18,532	48.64%	37417	0.50	6.5

Arch Hurley Conservancy District Water Usage 1946-2003						
Year	Water Released (Acre-Feet)	Water Delivered (Acre-Feet)	Delivery Efficiency	Total Acres Irrigated	Average Delivery per Acre (Acre-Feet)	Allocation (inches)
1978	51,686	25,950	50.21%	33173	0.78	8
1979	65,547	34,475	52.60%	31628	1.09	18
1980	72,748	41,128	56.53%	32902	1.25	18
1981	47,915	24,922	52.01%	32792	0.76	10
1982	66,275	38,716	58.42%	29704	1.30	18
1983	79,093	47,995	60.68%	20265	2.37	24
1984	75,043	39,750	52.97%	30871	1.29	18
1985	68,810	40,282	58.54%	31198	1.29	24
1986	64,782	36,676	56.61%	28321	1.30	18
1987	71,174	34,291	48.18%	26134	1.31	24
1988	62,487	32,260	51.63%	23683	1.36	24
1989	70,136	38,037	54.23%	32995	1.15	24
1990	78,491	41,965	53.46%	32500	1.29	18
1991	59,818	28,459	47.58%	32235	0.88	18
1992	85,277	53,735	63.01%	30137	1.78	24
1993	93,463	49,647	53.12%	34855	1.42	24
1994	95,261	49,656	52.13%	32817	1.51	24
1995	106,859	55,091	51.55%	32748	1.68	30
1996	95,648	44,754	46.79%	34466	1.30	24
1997	101,531	41,139	40.52%	33377	1.23	18
1998	109,089	67,817	62.17%	32227	2.10	24
1999	95,955	46,127	48.07%	32752	1.41	18
2000	118,244	60,241	50.95%	32302	1.86	24
2001	92,519	44,852	48.48%	30987	1.45	18
2002	15,472	7,205	46.57%	19445	0.37	3
2003	0	0	0.00%	0	0.00	0
Totals	4,641,173	2,436,372	2908.95%	1,771,440	77.83	981
Average	81,424	42,743	51.03%	31,078	1.37	22
Minimum	0	0	0	0	0	0
Maximum	132,960	69,512	63.01%	37,688	2.44	48

Source: AHCD

6.1.3 Self-Supplied Livestock

This category includes water used to raise livestock, maintain self-supplied livestock facilities, and provide for on-farm processing of poultry and dairy products (Wilson and Lucero,

1997,2003). In 2000, self-supplied livestock represented approximately 1 percent of the total water use in the county.

6.1.4 Self-Supplied Commercial, Industrial, Mining, and Power

The self-supplied commercial, industrial, mining, and power categories make up a very small proportion of the total water use in Quay County. Wilson and Lucero (1997) define these categories as follows:

- Commercial includes self-supplied businesses (e.g., motels, restaurants, recreational resorts, and campgrounds) and institutions. Self-supplied golf courses that are not watered by a public water supply are also included, as are off-stream fish hatcheries engaged in the production of fish for release.
- Industrial includes self-supplied enterprises engaged in the processing of raw materials or the manufacturing of durable or nondurable goods. Water used for the construction of highways, subdivisions, and other construction projects is also included.
- Mining includes self-supplied enterprises engaged in the extraction of minerals occurring naturally in the earth's crust, including (1) solids, such as coal and smelting ores, (2) liquids, such as crude petroleum, and (3) gases, such as natural gas. Water used for drilling and/or processing at a mine site is also included.
- Power includes all self-supplied power generating facilities.

As shown in Table 6-1 and Figures 6-1 and 6-2, the self-supplied commercial, industrial, mining, and power categories are a relatively small part of the county water demand. The published OSE records were used to represent historical demand in these sectors.

6.1.5 Reservoir Evaporation

As indicated in Table 6-1 and Figures 6-1 and 6-2, reservoir evaporation represents a significant portion of the water demand and is the second highest use category in the county. OSE combines measured or estimated monthly evaporation rates with monthly rainfall to compute a net evaporation rate. This evaporation rate is then used to compute the volume of evaporation (in acre-feet) based on the surface area of the reservoir and the depth of water in storage. The computed water use from reservoir evaporation is shown in Table 6-1. All reservoir evaporation is a consumptive use; there is no return flow in this category.

6.2 Future Water Uses

To determine the future demand for water in the region, it is necessary to not only evaluate historical water use as presented in Section 6.1, but to understand the demographics and economics of the region as well. In order to project future water demand for each of the water use categories discussed in Section 6.1, growth was projected in the following sectors:

- Public water supply and domestic
- Irrigated agriculture and livestock

Factors affecting potential growth were presented for each category. Since assumptions regarding one of these factors, economic growth, are somewhat uncertain, both high and low growth rates were established to bracket the range of future conditions that are likely to occur.

Table 6-6. Quay County Water Use Projections by Sector

Sector	2000	2010	2020	2030	2040
Low Use Scenario					
Irrigated agriculture	87970	83572	79393	75423	71652
Public and self-supplied domestic	2310	2661	2562	2384	2280
Livestock	878	834	792	753	715
Commercial	11	11	11	11	11
Industrial	0	0	0	0	0
Mining	0	0	0	0	0
Power	0	0	0	0	0
Reservoir evaporation	33310	33310	33310	33310	33310
Totals	124479	120388	116068	111881	107968
High Use Scenario					
Irrigated agriculture	113452	113452	113452	113452	113452
Public and self-supplied domestic	2310	3790	5271	6751	8231
Livestock	878	878	878	878	878
Commercial	11	11	11	11	11
Industrial	0	0	0	0	0
Mining	0	0	0	0	0
Power	0	0	0	0	0
Reservoir evaporation	34055	34055	34055	34055	34055
Totals	150706	152186	153667	155147	156627

Note: The amount of water use in 2000 for surface water and groundwater is shown in Table 5-1. In the future, the amount of water use with surface water or groundwater will depend on the alternatives implemented.

Sources for Low Use Scenario:

Irrigated agriculture Based on average withdrawal from 1946 to 2003, Then declining at 0.5% per year

Public and self-supplied domestic Based on .5% growth in consumption per year

Livestock Based on average consumptive use from 1960 to 1999. Then declining at 0.5% per year

Commercial Based on 2000 total withdrawal, held constant

Industrial Based on 2000 total withdrawal, held constant

Mining Based on 2000 total withdrawal, held constant

Power Based on 2000 total withdrawal, held constant

Reservoir evaporation Average evaporation withdrawal from 1990, 1995, 2000

Sources for High Use Scenario:

Irrigated agriculture Based on .80% of maximum withdrawal (Arch Hurley Cons. Dist. from 1946 to 2003) and OSE Reports 1975-2000.

Public and self-supplied domestic Based growth to at least 60% use of declared water rights and Ute Lake Reservation by 2040.

Reservoir Evaporation based on High Evaporation Withdrawal Reported from 1990-2000

Table 6-6 shows the projected future water demand for each water use category under high and low use scenarios. The proportion of water withdrawn from either surface water or groundwater resources in the future depends on the alternatives that are implemented (Section 8). Groundwater use is anticipated to remain significantly less than surface water use over the planning period.

6.2.1 Public Water Supply and Self Supplied Domestic

In order to translate the population projections into future water use, the municipal historical water use data presented in Section 6.1.1 were divided by the population of each municipality to determine an average water use rate in gallons per capita per day (gpcd) for that community.

In general, the municipal water use data was based on the amount of water pumped or diverted, rather than the amount of water sold (i.e., system losses were included) in order to provide a higher per capita use rate that will be more realistic in evaluating future demands. The per capita use rate was then multiplied by the projected population Table 6-7 to estimate a range of future projected water demands (low projections). To estimate future demand by self-supplied domestic wells, the rural population outside the incorporated areas was multiplied by the OSE Water Use water use rate (Wilson and Lucero, 2003) for the county. The population estimates for Quay County shows a slow decline in population. Therefore, the projected low use scenario water use based on current estimates for Quay County will show a decline in municipal water use.

The estimate for 2040 was estimated for this report using the trend information from the BBER report (August 2002). The estimates for the communities were derived by using the historical percentage of the total county population for each community. In addition the City of Tucumcari Comprehensive plan has been approved and was used for the Low, Medium and High Growth analysis. The High Use scenario used in Table 6-6 reflects more aggressive growth than that reflected in the Tucumcari Comprehensive Plan. The High Use is based on using 60% of the Ute Water Reservation and municipality declared water rights.

However, Quay County has the opportunity to use the sustainable water resource from the ENMRWS to attract new industry and jobs to the region. Projected future demand based on Quay County growing with aggressive economic development is presented in Table 6-6. This future water use assumes that the rates of use will steadily increase during the projection period and will at least be 60% of the declared water rights plus the Ute Reservoir reservation.

Table 6-7. Quay County Population Estimates

Projected Population: Quay County								
2000 to 2040								
Census Estimates								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	10,114*	10,030*	9,888*	9,659*	9,343*	8,986*	8,629
House	72	72	71	70	68	66	64	61
Logan	1094	1090	1081	1065	1041	1007	968	930
San Jon	306	305	302	298	291	282	271	260
Tucumcari	5989	5965	5915	5832	5696	5510	5300	5089
Balance of Quay County	2694	2683	2661	2623	2562	2479	2384	2289
Slow Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	10257	10359	10463	10567	10673	10780	10888
House	72	73	73	74	75	76	76	77
Logan	1,094	1105	1116	1127	1138	1150	1161	1173
San Jon	306	309	312	315	318	322	325	328
Tucumcari	5,989**	6049**	6109**	6170**	6232**	6294**	6357**	6421
Balance of Quay County	2,694	2721	2748	2776	2803	2831	2860	2888
Medium Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	10663	11196	11756	12343	12961	13609	14289
House	72	76	79	83	88	92	96	101
Logan	1,094	1149	1206	1266	1330	1396	1466	1539
San Jon	306	321	337	354	372	391	410	431
Tucumcari	5,989**	6288**	6603**	6933**	7280**	7644**	8026**	8427
Balance of Quay County	2,694	2829	2970	3119	3275	3438	3610	3791
Fast Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	11171	12288	13516	14868	16355	17990	19789
House	72	79	87	96	105	116	128	140
Logan	1,094	1203	1324	1456	1602	1762	1938	2132
San Jon	306	337	370	407	448	493	542	596
Tucumcari	5,989**	6588**	7247**	7971**	8768**	9645**	10610**	11671
Balance of Quay County	2,694	2963	3260	3586	3944	4339	4773	5250

*Source: University of New Mexico, Bureau of Business and Economic Research. Released August 2002.
**City of Tucumcari Comprehensive Plan, Consensus Planning-2004

Table 6-8. Projected Water Use Based on Population Projections

Projected Water Use: Quay County								
2000 to 2040								
Census Estimates								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	20	19	19	19	18	18	17
Logan (261gpcd)	320	319	316	311	304	294	283	272
San Jon (187gpcd)	64	64	63	62	61	59	57	54
Tucumcari (245gpcd)	1664	1657	1643	1620	1582	1531	1472	1414
Balance of Quay County (84gpcd)	253	252	250	247	241	233	224	215
TOTAL	2321	2312	2292	2260	2207	2135	2054	1972
Low Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	20	20	20	21	21	21	21
Logan (261gpcd)	320	323	326	329	333	336	339	343
San Jon (187gpcd)	64	65	65	66	67	67	68	69
Tucumcari (245gpcd)	1664	1680	1697	1714	1731	1748	1766	1784
Balance of Quay County (84gpcd)	253	256	259	261	264	266	269	272
TOTAL	2321	2344	2367	2391	2415	2439	2463	2488
Medium Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	21	22	23	24	25	26	28
Logan (261gpcd)	320	336	353	370	389	408	429	450
San Jon (187gpcd)	64	67	71	74	78	82	86	90
Tucumcari (245gpcd)	1664	1747	1834	1926	2022	2123	2230	2341
Balance of Quay County (84gpcd)	253	266	279	293	308	323	340	357
TOTAL	2321	2437	2559	2686	2821	2962	3110	3266
Fast Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	22	24	26	29	32	35	38
Logan (261gpcd)	320	352	387	426	468	515	567	623
San Jon (187gpcd)	64	71	78	85	94	103	114	125
Tucumcari (245gpcd)	1664	1830	2013	2214	2436	2679	2947	3242
Balance of Quay County (84gpcd)	253	279	307	337	371	408	449	494
TOTAL	2321	2553	2808	3089	3398	3738	4112	4523

6.2.2 Irrigated Agriculture

Irrigated agriculture is expected to remain stable or experience a moderate decline. Even if crop acreage remains stable, however, the amount of water used by the agriculture sector varies from year to year depending on climatic conditions. In order to bracket the change, the following scenarios were selected:

- *Low water use:* Though agricultural land may decline at a rate of 2 percent per year, it is expected that as land goes out of production, much of the water will be transferred to other agricultural land. This scenario thus assumed that agricultural acreage and water use declines at a moderate rate of 0.5 percent per year and that long-term average water use rates are representative of future conditions. For this scenario, the average water use (withdrawal) based on the average delivery through the Arch Hurley Conservancy District and the reported water use outside AHCD by OSE (Sorenson, 1976, 1981; Wilson, 1986, 1992; Wilson and Lucero, 1997, 2003). This amount was then decreased by 0.5 percent per year.
- *High water use:* Historically, many of the agricultural water rights holders in Quay County have not received enough water to fulfill their legal rights. Consequently, relying on projections that are based on historical water use may not reflect the true demand for water. Under this scenario, it was assumed that the demand for agricultural water is based on fulfillment of 80% of historic maximum demand.

6.2.3 Self-Supplied Livestock

Again, two scenarios were selected to bracket the possible climatic conditions:

- *Low water use:* The average livestock water use reported in the OSE Water Use Report (Wilson and Lucero,2003) was used to represent year 2000 water use. This amount was decreased by 0.5 percent per year to represent future water use.
- *High water use:* The maximum livestock water use reported in the NMDA and USDA data was used to represent year 2000 water use. This rate was held constant for future scenarios.

6.2.4 Self-Supplied Commercial, Industrial, Mining, and Power

While growth in the commercial, and industrial categories is expected to increase proportionally with residential growth, it is expected that most of these demands will be met through municipal water supplies. Because of the relatively small amount of water use apportioned to these sectors, combined with the lack of substantial changes in the projections for these categories (some changes that could either increase or decrease water use may be expected) (Appendix I), water use for these sectors was held constant for both the low and high water use scenarios.

6.2.5 Reservoir Evaporation

As with irrigated agriculture, reservoir evaporation is dependent on climatic conditions, and two scenarios were again used to bracket the possible conditions:

- *Low water use:* This scenario assumed that reservoir evaporation over the planning period is equal to the average category use, based on the six years of OSE data (1975, 1980, 1985, 1990, 1995, and 2000).

- *High water use.* This scenario assumed that reservoir evaporation over the planning period is equal to the maximum category use, based on the six years of OSE data (1975, 1980, 1985, 1990, 1995, and 2000).

6.2.6 Summary

The projections in Table 6-2 represent withdrawal requirements, which are greater than consumptive use requirements and are thus more conservative for use in planning. Because considerable uncertainty exists regarding future conditions and needs for water, the amount of water use projected will not necessarily be accurate for any given year. The low and high scenarios for future water use are intended to identify the range of future water demand that can reasonably be expected in Quay County. As regional water planning continues, estimates of future projected water use can be refined.

6.3 Water Conservation

As discussed in Section 6.1, more than 80 percent of the water used in Quay County is applied to irrigated agriculture. Consequently, the greatest potential for savings due to water conservation measures is in the agricultural sector. The majority of Irrigated agriculture within Quay County occurs within the Tucumcari Project/Arch Hurley Conservancy District. The District has prepared an Agriculture Conservation Plan which outlines water conservation measures and estimates of potential water savings, Appendix H.

Though municipal users represent a much smaller proportion of the total water use in the region, it is nonetheless important to consider implementation of water conservation measures to optimize the use of the available water resources. A discussion of municipal water conservation is included in Section 8.3.

Section 7 - Ability of Water Supply to Meet Demand

7. Ability of Water Supply to Meet Demand

In order to understand how the water supply in the region (Section 5) compares to the current and projected demands for water (Section 6), this section integrates the supply and demand information. First, water budgets showing the amount of water available and where it is used are presented in Section 7.1. These are followed by an analysis of the probability that water supplies (based on historical records) will be sufficient to meet projected demands in the region (Section 7.2).

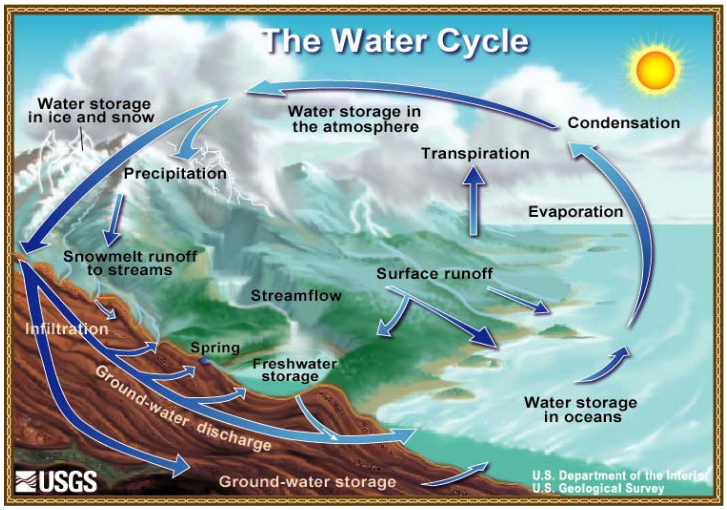
7.1 Water Cycle

The hydrologic cycle is a continuous process in which water moves from the oceans to the atmosphere, then to the land, and eventually back to the oceans using the energy of the sun. Components of the cycle include:

- The primary input is precipitation, part of which is intercepted by vegetation or structures and returned to the atmosphere by evaporation and part of which becomes runoff.
- Some precipitation seeps into the ground to become soil moisture, part of which is taken up by plant roots and returned to the atmosphere through the process of transpiration. It is difficult to separate these quantities, so they are typically combined into a single term known as evapotranspiration (ET).
- Runoff that is not intercepted or infiltrated flows through surface channels, from which it may be removed for various consumptive uses, or it may fill reservoirs where it sits in storage until used or evaporated.
- When soil moisture storage capacity is exceeded, recharge to groundwater occurs. Groundwater may reside in storage until withdrawn from a well, or where physical conditions allow, it may discharge into streams or lakes.

The hydrologic cycle is thus a complex movement of water through several subsystems.

Figure 7-1. the Water Cycle



7.1.1 Surface Water

Data for the surface water analysis was obtained from the following sources:

- Water usage data are from New Mexico OSE reports (Sorensen, 1976, 1981; Wilson, 1986, 1992, 2002; Wilson and Lucero, 1997).
- Reservoir Data from the USGS (2003), USACOE (2003), and OSE (2004).
- AHCD Data from AHCD(2004).
- ENMRWS from Smith Engineering Final Conceptual Report (2003).

7.1.1.1 Conchas Reservoir

Conchas Reservoir initiated under the Emergency Relief Act of 1935, was authorized by the Congress in the Flood Control Act of June 22, 1936, and was completed in 1940 by the Corps of Engineers. The Bureau of Reclamation and the Corps of Engineers, each under the authority of its separate department, set up a cooperative plan to regulate the reservoir storage capacity to best serve the requirements of irrigation and flood control.

The reservoir through the irrigation works provides surface water to Arch Hurley Conservancy District for irrigation of farm land within Quay county. The annual release of water for irrigation purposes is dependent on the inflow into the reservoir from precipitation within the drainage basin. The water budget for Quay County from Conchas reservoir based on 1991 to present data is shown in Table 7-1.

Table 7-1. Conchas Reservoir Budget

YEAR	LAKE EVAPORATION	FLOW - RES IN	FLOW - RES OUT	AVERAGE STORAGE	RELEASE TO AHCD	FARM DELIVERY
	AC-FT	AC-FT	AC-FT	AC-FT	AC-FT	AC-FT
1991	30,194	197,107	62,932	217,717	59,818	32,235
1992	42,380	112,932	89,100	288,119	85,277	30,137
1993	40,305	125,376	95,338	262,628	93,463	34,855
1994	41,603	234,319	163,613	274,678	95,261	32,817
1995	43,586	249,435	177,312	297,098	106,859	32,748
1996	42,497	120,456	97,476	282,475	95,648	34,466
1997	41,758	184,612	130,714	293,501	101,531	33,377
1998	44,306	107,850	111,376	266,637	109,089	32,227
1999	44,021	309,916	217,043	281,566	95,955	32,752
2000	42,416	68,820	121,006	240,825	118,244	32,302
2001	28,550	43,623	93,971	155,801	92,519	30,987
2002	19,761	26,873	17,095	91,150	15,472	19,445
2003	19,113	17,120	1,349	79,999	0	0
Non-Drought Budget	41,307	171,082	126,591	270,524	96,115	32,792
Drought Budget	19,113	17,120	1,349	79,999	0	0

The Surface Water Budget for Irrigation Purposes is wholly dependent on the water inflow and storage at Conchas Reservoir. The basic water budget for Conchas Reservoir is the water that is available for release based on precipitation and inflows. Drought conditions impact irrigation within Quay County as evidenced by zero release of irrigation water in 2003.

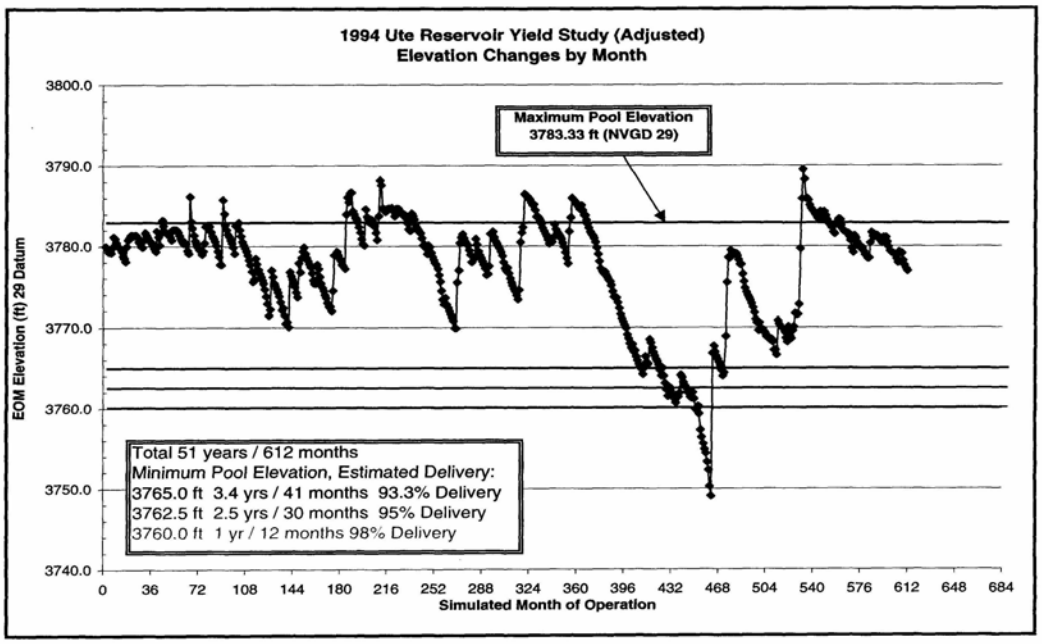
7.1.1.2 Ute Reservoir

Ute Reservoir was constructed to be a source of water for municipal and industrial purposes. Ute Reservoir was developed as a multiple purpose project and a permanent pool was established which provided for a reasonable amount of sport fishing and water recreation. The ISC entered into an agreement with the State Game Commission on August 20th, 1962. The N.M. Department of Game and Fish agreed to deposit funds each year with the ISC for the operation and maintenance of the Ute Dam. The ISC agreed to provide a minimum pool at Ute Reservoir for fisheries and recreation. Specifically, the ISC agreed to maintain water in Ute Reservoir at or above 3741.6 feet elevation, providing a water surface area of approximately 2,350 acres and an initial storage of 50,000 acre-feet of water. In 1964, under an agreement among New Mexico Parks and Recreation Commission, the ISC, and the New Mexico Game Commission, the Parks and Recreation Commission assumed responsibility for the surface of the reservoir for all non-fishing recreation purposes.

The water yield annually for municipal and Industrial purposes has been determined by the ISC and OSE to be 24,000 acre-feet annually. This amount has been reserved by regional governments and is the amount of yield upon which the ENMRWS is being developed, Section 5-1. The surface water available from Ute Reservoir which based on historical data that will be available to provide the 24,000 acre-feet annually for municipal and Industrial uses is shown in Figure 7-2.

The Village of Logan requested that the ENMRWA establish a minimum pool at elevation 3765.00 for the purpose of maintaining a quality pool for recreation and fishing purposes. The Village derives significant economic benefit from Ute Reservoir through recreation and seasonal residential activities. The reservoir has also attracted retired individuals to live near the lake for the fishing and recreational activities available. Figure 7-2 shows that 93% of the time over 50 years Ute Reservoir will deliver the full 24,000 acre-feet with the minimum pool established at elevation 3765.00.

Figure 7-2. Ute Reservoir Yield



Source; Douglas Murray, OSE

7.1.2 Ground Water

The output components of the groundwater budget are withdrawals from wells pumping water for a variety of beneficial purposes, as detailed in Table 6-3. As shown in Table 6-3, for the year 2000, irrigated agriculture was the largest single use of groundwater in the county, accounting for 72 percent of all groundwater depletions. As noted in Section 6.2.1.2, however, the OSE reported 1999 rates for irrigation in the 2000 report, since 2000 was a drought year and not representative of average conditions. The next largest component of groundwater use was for public water supplies, which accounted for 16 percent of the total reported groundwater depletions in the county during 2000. By far, the largest public water supply groundwater usage was the Tucumcari area.

The other major component of groundwater usage was for livestock, which accounted for 10 percent of depletions, while domestic and commercial usage accounted for the remaining 2 percent of groundwater depletions. The volume of all groundwater depletions reported by the OSE during the year 2000 totaled 7,719 acre-feet.

The input component of the groundwater budget is recharge. Groundwater recharge in Quay County is likely from infiltration of stream flow from the channels that carry runoff to the adjacent basin and from infiltration from the Tucumcari Project system of canals and laterals that carry irrigation water from the Conchas Reservoir to the project. Detailed groundwater monitoring and modeling would be required to fully evaluate sustainable yields for local resource areas.

The City of Tucumcari draws its water from the Entrada Sandstone aquifer west of Tucumcari and the alluvial aquifer under the town site. The Entrada Aquifer recharge was estimated to be 700 acre-feet per year or about 10% of precipitation (Trauger and Bushman, 1964). This recharge does not include recharge from canal flow near the Tucumcari Hoover Well Field. The alluvium under Tucumcari is estimated to recharge at a rate of approximately 450 acre-feet annually from precipitation and 2000 acre-feet annually from irrigation caused recharge by irrigation and canal flow (Trauger and Bushman, 1964).

Table 7-2. TUCUMCARI WELL FIELD PRODUCTION VS. ESTIMATED RECHARGE 1993-2003

TUCUMCARI WELL FIELD PRODUCTION VS. ESTIMATED RECHARGE 1993-2003				
WELL FIELD	TOTAL PRODUCTION (acre-feet)	AVERAGE ANNUAL PRODUCTION (acre-feet)	Estimated ANNUAL RECHARGE (acre-feet)	DIFFERENCE (acre-feet)
HOOVER	1194	119		
METRO	7822	782		
SUBTOTAL ENTRADA	9015	902	700	(-202)
TOWN	7266	727	2050*	1723
TOTAL PRODUCTION	16282	1628	2750	1122

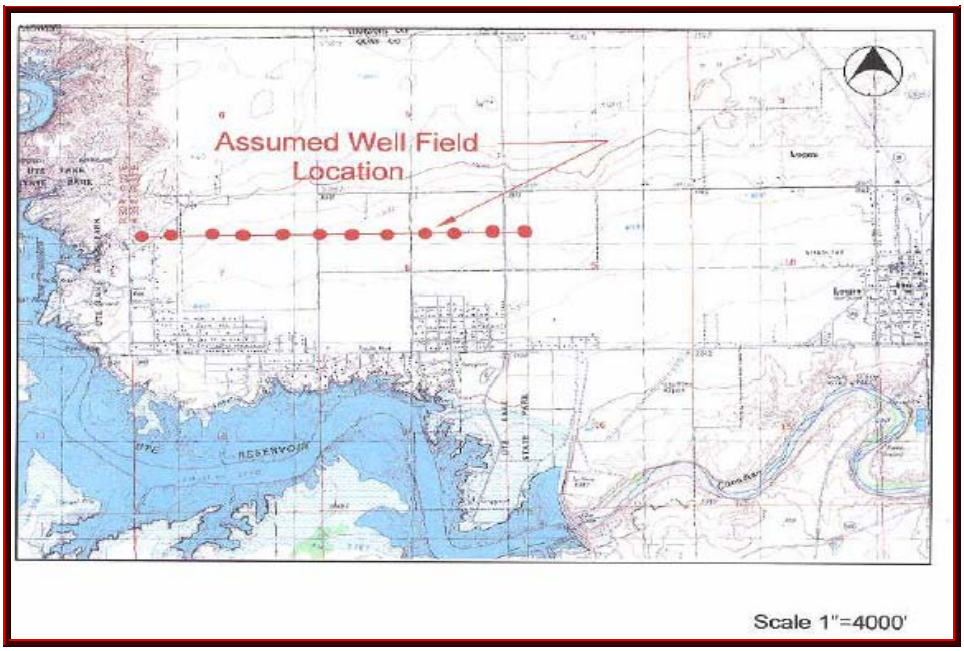
* Adjusted based on lack of flow in Conchas Canal for 2002 and 2003

The Village of Logan ‘s water supply is drawn from an older alluvium deposit overlying Chinle and Redondo formations. The tranmissivity is approximately 3000gpd/ft (Smith Engineering, Data Collection Report for ENMRWS, 1999). The Village of Logan well field is adjacent to Ute Reservoir and with the high transmissivity of the alluvium and the connection to the Reservoir suggests a natural recharge of the aquifer from Ute Reservoir. *If a 2 mile long line of wells were drilled at a location about 1 mile north of Ute Reservoir as shown on FIGURE 7-3, the capacity of the Santa Rosa Sandstone to convey water to those wells can be estimated using Darcy’s Law, with the following assumption:*

- *there would be sufficient number of wells in the line to achieve an average drawdown along the line of 2/3 of the saturated thickness.*

Solving Darcy’s Law yields a maximum well field capacity of 785 AF/YR (Smith Engineering,2003). This would provide an additional 785 acre-feet per year to the Village of Logan if appropriated.

Figure 7-3. Assumed Logan Well Field Location (Smith Engineering, 2003)

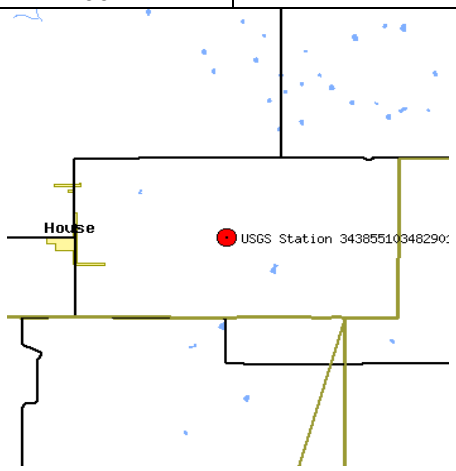
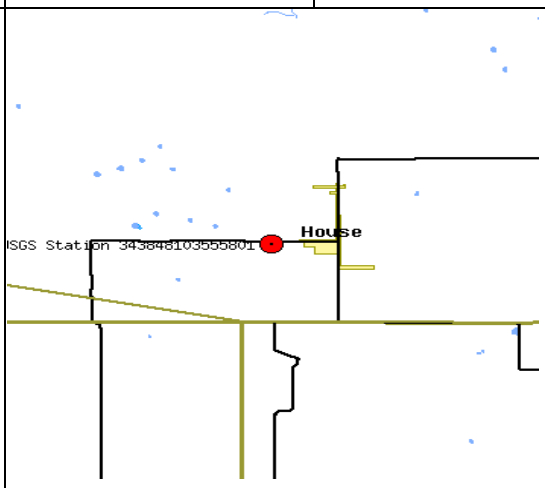


The Village of San Jon well field near Porter draws water from shallow alluvium deposits overlying the Chinle Formation. The transmissivity of the Chinle Formation is approximately 1gpd/ft, relatively impermeable. The Village of San Jon is constructing a 6" pipeline to connect to the Village of Logan Water System, Section 7.3.

The Village of House draws its water from the Ogallala formation and the aquifer is approximately 50-100 feet thick. The well yield is approximately 400 gallons per minute. There are two USGS monitoring wells in the vicinity of the Village of House well. The sites are shown in Table 7-3. The information show that the level in the monitoring wells has not been declined significantly due to municipal, domestic and irrigation pumping. The level of the monitoring well near House shows the water level higher in 2004 than in1968 by 0.39 feet. There are 73 wells declared in Township 5N Range 29E which is the Township that the House well is located in. The declared water rights for Township 5N Range 29 E is equal to 4652 acre-feet and the Village of House has 250 acre-feet declared or 5.37% of the water rights within the township.

The water rights declared in the Fort Sumner Basin within Quay County is equal to 17091 acre-feet; 854 for Municipal/Domestic and 16237 for irrigation. The OSE reported in the 2000 Water Use Report (Wilson and Lucero) that the total groundwater withdrawal in the Fort Sumner Basin for Public/Domestic Water use was 29.16acre-feet and for irrigated agriculture was 6546 acre-feet. The Village of House draws only a small percentage of the water pumped within the Fort Sumner Basin with the majority of water use for irrigated agriculture. There is a significant difference between the water rights declared and the amount of water withdrawn.

Figure 7-4. USGS Monitoring Wells near House

USGS 343855103482901 05N.30E.18.331311		**USGS 343848103555801 05N.28E.23.222232**	
Quay County, New Mexico		Quay County, New Mexico	
Latitude 34°38'55", Longitude 103°48'29" NAD27		Latitude 34°38'48", Longitude 103°55'58" NAD27	
Gage datum 4,634.20 feet above sea level NGVD29		Gage datum 4,788.00 feet above sea level NGVD29	
The depth of the well is 78 feet below land surface.		The depth of the well is 93.5 feet below land surface.	
This well is completed in OGALLALA FORMATION (121OGLL)		This well is completed in OGALLALA FORMATION (121OGLL)	
Date	**Water level, feet below land surface**	**Date**	**Water level, feet below land surface**
5/18/1944	39.08	1/26/1968	76.29
Minimum 3/28/1946	34.76	Minimum 12/17/1996	73.59
Average 1944-2004	43.77	Average 1968-2004	74.83
Maximum 9/25/1952	54.46	Maximum 2/18/1972	84.22
1/10/2004	45.74	1/10/2004	75.9
Difference 1944-2004	6.66	Difference 1968-2004	-0.39
			

7.2 Probability of Supply Meeting Demand

There is a high probability that the supply will meet the demand identified within the county during an average year. The demand for water for irrigated agriculture is highly dependant on the storage within Conchas Reservoir. Since 1946, the water released to the county farmers within Arch Hurley Conservancy District has averaged 81,424 acre-feet. Since 1946 there has been only three years where the release of water has been less than 38,000 acre-feet or 5.3% of the time. Two of those years were 2002 and 2003. There is at least a 90 % probability of the Conchas Reservoir supplying at least 45,000 acre-feet based on historical releases. According to the OSE there is a 93% chance over a 50 year time projection of the Ute Reservoir supplying the 24,000 acre-feet reserved by the ENMRWA with the minimum pool elevation raised to 3765.0. The demand for surface water appears that it will be met over 90% of the time.

The supply of groundwater appears to be adequate to meet the demand for Tucumcari Logan, House and Quay County in general over the 40 year planning period. The Ogallala aquifer is being depleted according to research by the USGS but impact to the House aquifer does not appear to be significant. Hydrological analysis and continual monitoring of the aquifers that serves the City of Tucumcari, Village of Logan, Village of House, Nara Visa and Forrest is necessary to assure adequate supply and to plan for future demand. The Village of House and Quay County on behalf of Forrest and Nara Visa may wish to pursue acquisition and transference of water rights to assure a stable supply over the 40 year period. Funding for hydrological analysis should be aggressively pursued by the Quay Working Group to verify the adequacy of the groundwater supplies. The communities need to monitor applications for new wells that may affect their water supply and coordinate with the OSE so that appropriate studies are initated to determine level of impact to municipal water supplies.

7.3 Village of San Jon Water Project

The Village of San Jon has initiated a project to construct a six (6) inch main trunk line to tie into the Village of Logan Water System. This will provide the Village of San Jon with a new source of municipal water than they historically had used. The Village of San Jon has relied on nine wells to supply the village. The capacity of the wells ranged from 7gallons per minute to 35 gallons per minute. The village will maintain its well field for use in case there is an interruption in flow from the Logan Water System.

The project will install a 6” High Density Polyethylene Pipe from the existing 250,000 Gallon storage tank on Quay county Road 67 west along CR 67, north adjacent to CR T, west adjacent to NM 469 including a bridge crossing of Revuelto Creek and crossing of US 54, and west adjacent to old NM 552 to tie into the Logan Village water system. The project includes construction of a surge tank and booster station near the intersection of NM469 and CR T.

This project will provide the Village of San Jon with an adequate water supply over the 40 year life of the plan.

Section 8 - Analysis of Alternatives

8. Analysis of Alternatives for Meeting Future Demand

Once the region has studied their water supply and projected future demand for water, the next key component of the regional water plan is to develop alternatives for meeting, maintaining, and managing the projected water demand/supply. Alternatives are actions that the region can take to increase supply, reduce demand, protect or improve water quality, or better manage water resources so that the water supply of the region continues to be viable.

8.1 Identification and Selection of Alternatives

In accordance with the ISC template, the alternatives defined by the steering committee fall into the categories of water resource management, water conservation, water and infrastructure development, and water quality management (Table 8-1). A list of alternatives identified by the Steering Committee for analysis within this *County Plan* are as follows:

- Participate in ENMRWS
- Developing county and city ordinances for conservation
- Develop a Drought Plan
- Pursuing water rights transfers or leases to help supply projected demand
- Appropriating and reserving groundwater for the region
- Developing and implementing county-wide septic tank and other water quality control ordinances
- Recycling municipal wastewater for agricultural and recreational use
- Implementing growth management and land use planning
- Desalination
- Providing public outreach and educational activities

The priority alternatives were evaluated with regard to their technical feasibility, political feasibility, social and cultural impacts, financial feasibility, and hydrologic and environmental impacts. No legal issues that would prohibit implementation of any of the alternatives were identified, though in some cases permits or other legal concerns would need to be addressed. Legal issues affecting the water supply in the region are discussed in Section 4.

Table 8-1. Alternatives for Meeting Future Water Supply Needs

Priority Alternatives	Other Alternatives
Water Supply Conservation	
• Implement voluntary agricultural water conservation measures • Develop county and city water conservation ordinances Evaluate water/sewer rates • Recycle Municipal Wastewater for Agricultural and Recreational Use • Implement efficiencies in municipal water supply management (e.g., leak detection)	• Remove Invasive Vegetation • Xeriscape to conserve (municipal) water • Build Additional Water Storage Capacity (Above and Underground) • Maintain Existing Treatment Plants and upgrade mains and other infrastructure
Water Quality Protection	
• Develop and Implement county septic tank and water quality control ordinances • Construct/Upgrade wastewater treatment systems to replace septic tanks in Logan and preserve water quality • Maintain and update source water and wellhead protection plans for key water supplies	• Implement non-point source management projects • Monitor natural gas extraction activities for potential impacts to groundwater quality/quantity
Water Resource Management	
• Participate in ENMRWS • Implement drought contingency plan • Pursue water rights transfers or leases that could supply projected demand • Implement growth management and land use planning • Develop and implement city and county ordinances to control domestic wells • Appropriate and reserve groundwater for the region • Desalination	• Establish regional water banking (accounting) source for drought periods • Declare Remainder of Quay County
General Actions	
• Public education and outreach (materials, events, brochures) • Seek funding for continued planning and implementation projects • Interact with political leaders to develop support (state and federal legislators)	

8.2 Participate in ENMRWS

The Eastern New Mexico Rural Water System (ENMRWS) will, when implemented, provide east-central New Mexico communities and counties with a sustainable source of water for municipal and industrial use. Ute Reservoir, on the Canadian River near Logan, NM, provides an alternative to provide for future municipal and industrial water supply needs in Curry, Roosevelt and Quay counties. The New Mexico Legislature recognized the water supply problems in Eastern New Mexico when it passed an Act authorizing the State Engineer to

construct a dam on the Canadian River near Logan in 1959. In 1975, 1978 and 1981, the New Mexico Legislature authorized and funded improvements to the spillway to increase storage at Ute Reservoir. A 1994 study by the New Mexico Interstate Streams Commission (ISC) estimated the *annual yield* to be 24,000 acre-feet per year in all but extreme drought years.

8.2.1 Original Conceptual Design

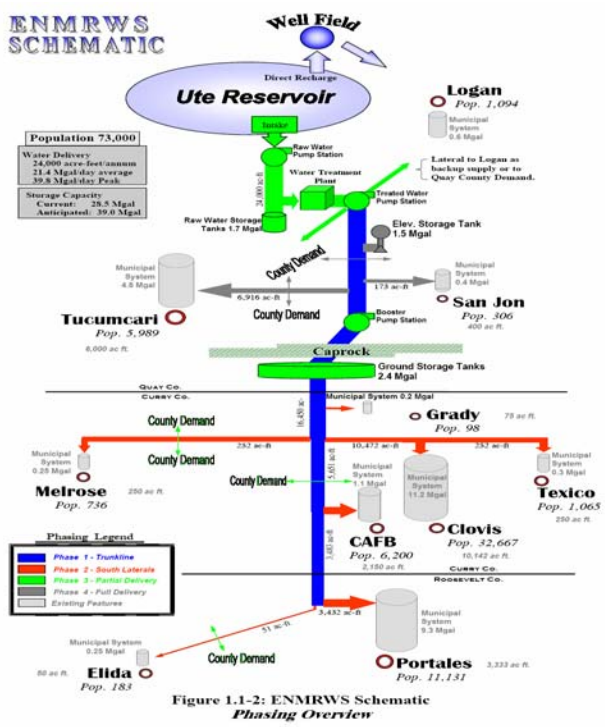
The project as conceptual included in the final Conceptual Design Report prepared by Smith Engineering is a conventional treatment and pumping (CTP) system including:

A lakeside intake structure and raw water pumping station.
Raw water storage tanks.
A water treatment plant.
A treated water pump station.
Treated water elevated storage.
A main transmission pipeline, which would serve all agencies of the UWC.
Lateral pipelines to each of the participating communities.

The proposed project is anticipated to take approximately 10 years, from the completion of the Conceptual Design Report in August 2003, to the completion of construction of Phase 4 improvements in October 2013. The main activities envisioned are as follows:

- Project Development Activities—July 2003 through January 2011.
- Construction Activities—November 2006 through October 2013
  Phases 1 though 4

Figure 8-1. ENMRWS Schematic (Smith Engineering)



Smith Engineering

8.2.1.1 Original Cost Estimate

Total probable project costs for the recommended plan are;

FIXED COSTS	
TOTAL CONSTRUCTION COST	**$216,000,000**
CAPITAL OUTLAY FOR FEDERAL SHARE (80%)	$172,800,000
CAPITAL OUTLAY FOR STATE SHARE (10%)	$21,600,000
CAPITAL OUTLAY FOR LOCAL ENMRWA MEMBER SHARE (10%)	$21,600,000
NON-CONSTRUCTION COST	
DETAILED DESIGN SERVICES	$13,000,000
FUNDING ACTIVITIES	$250,000
PUBLIC EDUCATION PROGRAMS	$250,000
ENVIRONMENTAL AND PERMITTING	$1,500,000
CONSTRUCTION MANAGEMENT SERVICES	$13,000,000
TOTAL NON-CONSTRUCTION COST	**$28,000,000**
CAPITAL OUTLAY FOR ENMRWA MEMBER SHARE	**$2,800,000**
TOTAL FIXED COSTS - ALL PHASES FULL DELIVERY	**$244,000,000**
FEDERAL SHARE (80%)	$195,200,000
STATE SHARE (10%)	$24,400,000
ENMRWA MEMBER SHARE (10%)	$24,400,000
RECURRING COSTS	
RAW WATER COST ($25 PER AC-FT TO ISC)	$600,000
DEBT SERVICE ON FINANCED SHARE (20 YEAR PERIOD)	$1,950,600
COST OF OPERATION AND MAINTENANCE (5 YEAR PERIOD)	$9,815,000
REPLACEMENT COSTS (5 YEAR PERIOD)	$478,000
ISC UTE RESERVOIR O&M FEE ($5.60 / AF)	$134,400
SUB-TOTAL ANNUALIZED COSTS	**$12,978,000**
SYSTEM AVERAGE WATER RATE PROJECTION ($ PER 1000 GALLONS)	**$ 1.66**

8.2.1.2 Original Costs Distributed to Quay County Entities

The annual costs to each of the participating communities and Quay county for water delivered to the community is as shown in this section. The cost of the water is the wholesale cost of the water to the City/Villages/County and not the cost charged per 1000 gallons to the end users. The administrative and distribution costs associated with the individual water systems plus maintenance of wells for use in absence of water delivery through the ENMRWS pipeline is additional to the wholesale costs and will need to be reflected in water rates.

Table 8-2. Original ENMRWS Cost Estimate Summary

ENMRWS Cost Estimate Summary Original Estimate							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122889	21707	562223	0	4341310	1427953	6476083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$2,151,355	$1,187,006	$48,635,237	$10,457,163	$134,266,124	$47,160,975	$243,857,860
Fed share @80%**	$1,721,084	$949,605	$38,908,190	$8,365,730	$107,412,899	$37,728,780	$195,086,288
State share @10%**	$215,136	$118,701	$4,863,524	$1,045,716	$13,426,612	$4,716,098	$24,385,786
Local share @10% **	$215,136	$118,701	$4,863,524	$1,045,716	$13,426,612	$4,716,098	$24,385,786
**with peer review							
Subtotal Annualized costs **	$120,257	$64,189	$2,625,528	$555,644	$7,138,160	$2,474,486	$12,978,264
Water Rate Projection ($/1000gal)							
Annual Reservation	$0.92	$1.31	$1.34	$1.71	$1.69	$2.18	$1.66
Recorded Usage †	$0.98	$2.96	$4.67		$1.64	$1.73	$2.00

8.2.1.3 Peer Review

The ENMRWA contracted with Jarnis Environmental Consultants for an independent review of the conceptual cost estimate. The ENMRWA was provided with a final Conceptual Design Peer Review report dated December 2003, Jarnis Environmental Consultants. The results of the report are reflected in Table 8-3.

Table 8-3. Peer Review Cost Estimate Summary

ENMRWS Cost Estimate Summary Peer Review Estimate							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122,889	21,707	562,223	0	434,1310	1,427,953	6,476,083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$2,610,856	$1,453,772	$59,159,617	$12,727,922	$163,356,495	$57,379,488	$296,688,150
Fed share @80%**	$2,088,685	$1,163,018	$47,327,694	$10,182,337	$130,685,196	$45,903,591	$237,350,520
State share @10%**	$261,086	$145,377	$5,915,962	$1,272,792	$16,335,650	$5,737,949	$29,668,815
Local share @10% **	$261,086	$145,377	$5,915,962	$1,272,792	$16,335,650	$5,737,949	$29,668,815
**with peer review							
Subtotal Annualized costs **	$142,884	$77,314	$3,143,653	$667,430	$8,570,278	$2,977,543	$15,579,102
Water Rate Projection ($/1000gal)							
Annual Reservation	$1.10	$1.58	$1.61	$2.05	$2.03	$2.62	$1.99
Recorded Usage †	$1.16	$3.56	$5.59		$1.97	$2.09	$2.41

8.2.2 Alternates

The project as proposed will result in a wholesale water rate to the communities ranging from $1.10 for Logan to $5.69 for the City of Tucumcari depending on the amount of water delivered and sold. The Village of Logan is the only entity within Quay County where the amount of water produced annually is nearly equivalent to the amount of water reserved annually from Ute Reservoir. In order to participate in the ENMRWS the communities of Quay County and Quay County itself must determine if it is financially prudent to participate in the project. The following alternatives modify the community's participation in the project ranging from identifying points of delivery for Quay County Reservation to delay of Phase IV implementation until demand within the County increases from aggressive economic development activities to match reservations.

8.2.2.1 Quay County Alternative

The ENMRWS Conceptual Design Report, Smith Engineering, provided costs for Quay county the full length of the trunk line within Quay County based on the 1000 Ac. Ft. Reservation. The schematic of the project shown in figure 8-1 shows that Quay County's 1000 acre-feet reservation is planned to be distributed as follows; 61 acre-feet to be included in the Logan Lateral, 23 acre-feet included with the San Jon lateral and 916 acre- feet include with the

Tucumcari Lateral. The schematic does not show any of the reservation by Quay County to be taken past the Tucumcari Lateral.

It would be prudent to reflect that some of the reservation by the county would be taken to meet demand in the area above the caprock. Fifty (50) acre-feet was used for cost comparison purposes to be taken from the Ground Storage Tank on the Caprock to serve the county through a gravity flow lateral to be built by the county or developers as demand is identified. The county with the support of the ISC has agreed to provide 65 acre-feet of its allocation to the South Shore subdivision adjacent to Ute Lake. The developers are to be responsible for infrastructure to divert, treat and transport the water to the users within the subdivision. The county has also stated that the 23 acre-feet included with the San Jon Lateral should be increased to 300 Acre-Feet to address county demand east and west of the new San Jon lateral under construction. Table 8-4 reflects the costs associated with 885 acre-feet of the County's reservation assigned to the planned laterals and 50 acre-feet along the trunk line to the ground storage tank.

Table 8-4. Quay County takes Reservation through Planned Laterals

ENMRWS Cost Estimate Summary Quay County establishes Tucumcari(524af), Logan(61af), And San Jon Lateral(300af) as Water Connection and provides 50 Ac.-Ft. to Caprock.							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122889	21707	562223	1	4341310	1427953	6476083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$2,780,644	$1,175,207	$63,094,229	$9,538,686	$163,456,800	$55,913,864	$295,959,430
Fed share @80%**	$2,224,516	$940,165	$50,475,383	$7,630,948	$130,765,440	$44,731,091	$236,767,544
State share @10%**	$278,064	$117,521	$6,309,423	$953,869	$16,345,680	$5,591,386	$29,595,943
Local share @10% **	$278,064	$117,521	$6,309,423	$953,869	$16,345,680	$5,591,386	$29,595,943
**with peer review							
Subtotal Annualized costs **	$151,383	$63,941	$3,340,463	$513,944	$8,591,405	$2,912,135	$15,573,272
Water Rate Projection ($/1000gal)							
Annual Reservation	$1.16	$1.31	$1.71	$1.89	$2.03	$2.57	$1.99
Recorded Usage †	$1.23	$2.95	$5.94		$1.98	$2.04	$2.40

8.2.2.2 Logan Alternative

The ENMRWS final conceptual report, Smith Engineering –Sept. 2003, states on page v. of the Executive Summary that;

> *Logan's proximity to the lake affords it a unique alternative; an excellent case may be made that the existing geohydrologic connection between the reservoir and the Logan's well field already recharges Logan's Aquifer. If so, Logan could file with the Office of the State Engineer (OSE) to extract its reservation from its existing well fields without the need for significant additional infrastructure.*

Table 8-5. Logan Alternative Costs

ENMRWS Cost Estimate Summary Logan Draws Reservation From Existing Well Field							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual Reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122,889	21,707	562,223	0	4,341,310	1,427,953	6,476,083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$0	$1,200,566	$63,306,377	$9,181,993	$165,744,036	$56,526,458	$295,959,430
Fed share @80%**	$0	$960,453	$50,645,102	$7,345,594	$132,595,229	$45,221,166	$236,767,544
State share @10%**	$0	$120,057	$6,330,638	$918,199	$16,574,404	$5,652,646	$29,595,943
Local share @10% **	$0	$120,057	$6,330,638	$918,199	$16,574,404	$5,652,646	$29,595,943
**with peer review							
Subtotal Annualized costs **	$12,240	$64,784	$3,357,668	$490,969	$8,706,897	$2,940,714	$15,573,272
Water Rate Projection ($/1000gal)							
Annual Reservation	$0.09	$1.33	$1.72	$1.80	$2.06	$2.59	$1.99
Recorded Usage †	$0.10	$2.98	$5.97		$2.01	$2.06	$2.40

Section 3.1 of the Water System report states;

> *In the case of Logan, the geohydrologic connection between the Ute Reservoir and Logan's well field is well known.* ***Logan has the choice, then, of participating in the project to take delivery of their water reservation, <u>or</u> to obtain a permit to draw the reservation from their existing well fields without any new infrastructure.***

In the event that the Village of Logan chooses to pursue the option included in the report; the cost to the village per 100 gallons would decrease significantly. Table 8-5 summarizes the costs for the ENMRWS with the Village of Logan exercising its option to draw the reservation from their existing well field. The costs associated with Quay County taking it's reservation except for 50 acre-feet through the laterals is also reflected in Table 8-5 (8.2.2.1).

8.2.2.3 Village of San Jon Alternative

The village of San Jon has already commenced work on the construction of a new pipeline to tie the Village of San Jon water system into the Village of Logan Water System. This work provides the village of San Jon the option of using the new pipeline in lieu of the proposed lateral included in the ENMRWS conceptual design report. This provide two alternative costs scenarios based on this construction. The first cost scenario is the costs associated with The Village of San Jon taking their reservation through the Logan Lateral and the second is to take their reservation through the Logan Well Field. Tables 8-6 and 8-7 reflect the two options as stated with the cost associated with the Quay Alternate included.

Table 8-6. Village of San Jon Alternative – Logan Lateral

ENMRWS Cost Estimate Summary San Jon Uses new Water Line and San Jon Lateral not Built							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122,889	21,707	562,223	0	4,341,310	1,427,953	6,476,083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$2,569,223	$963,459	$62,784,595	$8,783,455	$164,600,441	$56,258,257	$295,959,430
Fed share @80%**	$2,055,378	$770,767	$50,227,676	$7,026,764	$131,680,353	$45,006,606	$236,767,544
State share @10%**	$256,922	$96,346	$6,278,460	$878,346	$16,460,044	$5,625,826	$29,595,943
Local share @10% **	$256,922	$96,346	$6,278,460	$878,346	$16,460,044	$5,625,826	$29,595,943
**with peer review							
Subtotal Annualized costs **	$141,124	$53,667	$3,325,439	$477,298	$8,646,898	$2,928,846	$15,573,272
Water Rate Projection ($/1000gal)							
Annual Reservation	$1.08	$1.10	$1.70	$1.75	$2.05	$2.58	$1.99
Recorded Usage †	$1.15	$2.47	$5.91		$1.99	$2.05	$2.40

Table 8-7. Logan and San Jon take Reservation through Logan Well Field

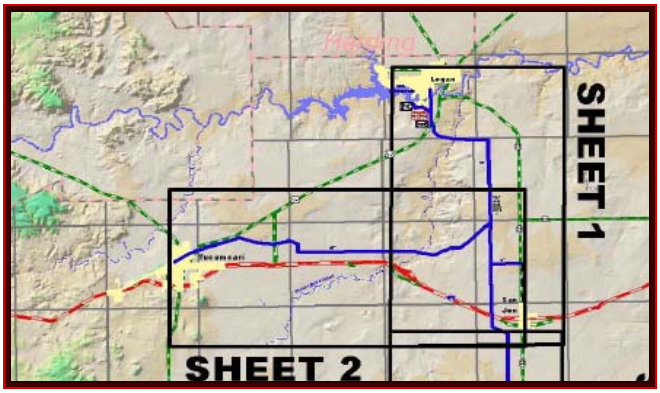
ENMRWS Cost Estimate Summary Logan and San Jon Draw Reservations From Existing Well Field							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122,889	21,707	562,223	0	4,341,310	1,427,953	6,476,083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$0	$0	$63,639,527	$6,516,965	$168,525,875	$57,277,063	$24,324,576
Fed share @80%**	$0	$0	$50,911,622	$5,213,572	$134,820,700	$45,821,651	$295,959,430
State share @10%**	$0	$0	$6,363,953	$651,696	$16,852,587	$5,727,706	$236,767,544
Local share @10% **	$0	$0	$6,363,953	$651,696	$16,852,587	$5,727,706	$29,595,943
**with peer review							
Subtotal Annualized costs **	$12,240	$4,590	$3,374,371	$357,349	$8,846,374	$2,978,348	$15,573,272
Water Rate Projection ($/1000gal)							
Annual Reservation	$0.09	$0.09	$1.73	$1.31	$2.09	$2.62	$1.99
Recorded Usage †	$0.10	$0.21	$6.00		$2.04	$2.09	$2.40

8.2.2.4 Tucumcari Alternative

The City of Tucumcari is planned to take their reservation through the proposed Lateral which connects to the trunk line at Station 674 + 20 which is 54840 feet (10.39 miles) from the Water Treatment Plant. The lateral itself is planned to be 191,100 feet (23 Miles) long. The total length that the City of Tucumcari is sharing in pipeline costs is 33.39 miles. The Distance from the Water Treatment Plant to the City of Tucumcari connection adjacent to US 54 would be approximately 20.5 miles. Figure 8-2 shows the area map from the ENMRWS Conceptual Design Report, Smith Engineering, which depicts the route of the trunk line and Tucumcari Lateral compared to a lateral along US 54.

The conceptual report also sized the lateral to gravity flow from the Elevated storage tank. The size of the lateral could be reduced from the planned 36" to a 30" lateral pipeline. The City of Tucumcari (6000af)and Quay County (524) based on their respective proportionate amount of water pumped through the pipeline would share the costs of pumping the water (approx. $100,000/annually) from the Water Treatment Plant to Tucumcari Water System. Table 8-8 reflects costs associated with changing the Tucumcari Lateral to run adjacent to US 54 and eliminate the Elevated Storage Tank from the project. Quay County costs are for their reservation to be taken through the laterals (8.2.2.1) and only 50 acre-feet to be delivered to the caprock Ground Storage Tank. San Jon would take their reservation through the Logan Lateral and the San Jon lateral is not included in the costs.

Figure 8-2. Tucumcari Lateral Alignment



Smith Engineering 2003

Table 8-8. Tucumcari Alternative

ENMRWS Cost Estimate Summary Tucumcari Lateral is Built along US 54 from Water Treatment Facility (San Jon and Logan use Logan Lateral)							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual Reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped*†	122,889	21,707	562,223	0	4,341,310	1,427,953	6,476,083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$2,591,045	$971,642	$56,647,550	$7,879,107	$170,049,921	$57,820,164	$295,959,430
Fed share @80%**	$2,072,836	$777,314	$45,318,040	$6,303,285	$136,039,937	$46,256,132	$236,767,544
State share @10%**	$259,105	$97,164	$5,664,755	$787,911	$17,004,992	$5,782,016	$29,595,943
Local share @10% **	$259,105	$97,164	$5,664,755	$787,911	$17,004,992	$5,782,016	$29,595,943
**with peer review							
Subtotal Annualized costs **	$142,183	$54,064	$3,027,650	$433,416	$8,911,324	$3,004,635	$15,573,272
Water Rate Projection ($/1000gal)							
Annual Reservation	$1.09	$1.11	$1.55	$1.59	$2.11	$2.65	$1.99
Recorded Usage †	$1.16	$2.49	$5.39		$2.05	$2.10	$2.40

8.2.2.5 Delay Phase IV of ENMRWS

This alternative is to pursue delaying the implementation of Phase IV of the ENMRWS until demand in Quay county shows an increase that will support the reservation of water by Quay County members. This alternative shows all communities taking their reservation through the ENMRWS (Quay County Alternative) although the proportional reductions reflected in the Logan/San Jon alternates would apply.

Table 8-9. Delay Phase IV

ENMRWS Cost Estimate Summary Delay Phase IV							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Annual Reservation*	130,341	48,878	1,955,109	325,851	4,225,315	1,134,941	7,820,434
Annual Water Pumped* †	122,889	21,707	562,223	0	4,341,310	1,427,953	6,476,083
*1000 gallons †Highest Usage Recorded							
Total Fixed Costs**	$612,215	$352,230	$7,323,006	$2,299,756	$133,946,339	$45,861,661	$190,395,206
Fed share @80%**	$489,772	$281,784	$5,858,404	$1,839,805	$107,157,071	$36,689,329	$152,316,165
State share @10%**	$61,222	$35,223	$732,301	$229,976	$13,394,634	$4,586,166	$19,039,521
Local share @10% **	$61,222	$35,223	$732,301	$229,976	$13,394,634	$4,586,166	$19,039,521
**with peer review							
Subtotal Annualized costs **	$40,445	$23,038	$472,002	$148,869	$8,538,475	$2,895,815	$12,118,645
Water Rate Projection for Phases I-III ($/1000gal)							
Annual Reservation	$0.31	$0.47	$0.24	$0.55	$2.02	$2.55	$1.55
Recorded Usage †	$0.33	$1.06	$0.84		$1.97	$2.03	$1.87
Phase IV							
Total Fixed Costs**	$1,643,516	$616,319	$43,503,518	$5,468,445	$1,861,141	$499,196	$53,592,135
Fed share @80%**	$1,314,813	$493,055	$34,802,814	$4,374,756	$1,488,913	$399,357	$42,873,708
State share @10%**	$164,352	$61,632	$4,350,352	$546,845	$186,114	$49,920	$53,592,135
Local share @10% **	$164,352	$61,632	$4,350,352	$546,845	$186,114	$49,920	$5,359,214
**with peer review							

ENMRWS Cost Estimate Summary Delay Phase IV							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Subtotal Annualized costs**	$108,577	$40,312	$2,804,007	$353,987	$118,639	$31,520	$3,457,042
Total Annualized Costs All Phases							
Annualized costs**	$149,022	$63,350	$3,276,009	$502,856	$8,657,115	$2,927,335	$15,575,687
Water Rate Projection ($/1000gal)							
UWC Reservation	$1.14	$1.30	$1.68	$1.85	$2.05	$2.58	$1.99

8.2.2.6 Do Not Participate in ENMRWS or Participate Minimally

The communities and Quay County do have the option of maintaining their reservation by paying the annual $25.00 per acre-foot raw water cost and the $5.60 per acre-foot operation and maintenance fee for Ute Reservoir to the ISC. The communities may choose to delay taking their reservation from the Reservoir and not participate at all or participate on a very limited basis, such as in the raw water intake structure and raw water storage tanks and delay any additional infrastructure until demand is identified. The costs to the communities on an annual basis for the both the non-participating in ENMRWS and minimal participation IN ENMRWS scenarios are shown in Table 8-10 and Table 8-11.

Table 8-10. No Participation by Quay County in ENMRWS

ENMRWS Cost Estimate Summary No Participation by Quay County in ENMRWS							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Subtotal Annualized costs	$12,240	$4,590	$183,600	$30,600	$11,096,193	$3,725,712	$15,052,935
Annual Reservation ($/1000gal)	$0.09	$0.09	$0.09	$0.09	$2.63	$3.28	$1.92
Recorded Usage ($/1000gal)†	$0.10	$0.21	$0.33		$2.56	$2.61	$2.32

†Highest Usage Recorded

Table 8-11. Minimal Participation in ENMRWS (Raw Water Intake and Storage)

ENMRWS Cost Estimate Summary Minimal Participation in ENMRWS (Raw Water Intake and Storage)							
	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Subtotal Annualized costs	$25,591	$10,001	$420,363	$65,175	$10,891,647	$3,659,525	$15,085,502
Annual Reservation ($/1000gal)	$0.20	$0.20	$0.22	$0.20	$2.58	$3.22	$1.93
Recorded Usage ($/1000gal)†	$0.21	$0.46	$0.75		$2.51	$2.56	$2.33

†Highest Usage Recorded

8.2.3.1 Technical feasibility

Participation in the proposed ENMRWS is both technically and legally feasible. The Project has been in planning and development stages for more than 40 years and there are a number of studies and reports which support the feasibility of the project.

> ***June 1963*** Consulting Engineers Ted Scanlon and Jack Verhines (Scanlon & Associates, Inc.) propose Ute Dam as a potential water supply for eastern NM communities.
> ***Sept 14, 1964*** The Feasibility Study (Scanlon and Associates, Inc.) was delivered to all member communities and applicable state and federal agencies. It determined that the project was feasible and could deliver treated water at estimated costs ranging from $0.13 per 1000 gal. to $0.42 per 1000 gal.
> ***Aug 8, 1968*** A feasibility report was distributed by the BOR.
> ***Sept 3, 1976*** The final environmental document was circulated by the BOR.
> ***Sept 1989*** A Design Summary Report was completed by the BOR. It described three water treatment plants including water softening. It called for four stages of construction to be implemented over 9.5 years.
> ***Mar 1993*** The BOR prepared a Special Environmental Report to describe the environmental consequences of developing the Eastern NM Water Supply Project.
> ***Dec 1, 1994*** The Ute Reservoir Yield Update Study by John Whipple (ISC) described that sediment inflow to Ute Reservoir is not as large as previous projections, and illustrates that annual yield can be increased substantially if member communities can accept occasional small shortages.
> ***August 2003*** Smith Engineering submitted Final Conceptual Report for the ENMRWS.

8.2.3.2 Financial Feasibility

The feasibility of the project will greatly depend on the local ability and willingness to pay for the proportionate costs of the project. The project is anticipated to be funded with a 80/10/10 funding model with the Federal Government providing 80% of the costs and the State and Local participants providing 10% of the funds respectively. Local capital costs required beyond the

connection of the ENMRWS to the community water system will be the responsibility of the local participant. For example, Quay County currently does not operate a water system and all costs to design and construct a delivery system to deliver water to residential and commercial customers would be the responsibility of the County. Obviously, the county could apply for additional State and Federal funding for the delivery system but that funding would be independent of the ENMRWS.

Costs for the ENMRWS are currently apportioned in the Conceptual Design Report (Smith Engineering, 2003) among UWC members according to the following criteria;

- Construction costs of shared ("common") facilities are apportioned according to the amount of water reserved by each member served. The water treatment plant, for example, serves all members so that each member's share is prorated based on the ratio of their reservation divided by 24,000 acre-feet.
- Main transmission "trunk line" pipeline costs are prorated on the basis of Ute water reservation and length of trunk pipeline from the water treatment facility to the member community (includes county share along trunk line and laterals).
- Member specific construction, such as laterals, is attributed to the member directly. For laterals, both the member served and the county share in the cost. Member specific costs are not shared. The tie-in from the ENMRWS to each member is an example of a member specific cost.
- Operation, maintenance and replacement costs are prorated on the percentage of total construction cost attributable to individual members, and the proposed infrastructure phasing scheme.
- Fixed, non-construction costs are prorated on the percentage of total construction cost attributable to individual members.

Local O&M costs by the above proration and as shown in Table 8-3 are the responsibly of the local member participant. The local O&M costs along with the proposed annual debt payments, to repay bonding for the fixed construction and non-construction costs, and the annual ISC payments result in the annualized amounts estimated for each participant. The annualized payments are the basis of whether the project is financially feasible for each community. Table 8-12 shows the summary of wholesale water rates to the communities based on their respective reservation amount.

Table 8-12. Summary of Alternatives Water Rates Based on Reservation

Summary of Alternatives Water Rates Based on Reservation						
Alternate	**Logan**	**San Jon**	**Tucumcari**	**Quay Co.****	**Curry Co.**	**Roosevelt Co.**
Original	**$0.92**	**$1.31**	**$1.34**	**$1.71**	**$1.69**	**$2.18**
Peer Review	**$1.10**	**$1.58**	**$1.61**	**$2.05**	**$2.03**	**$2.62**
Quay County	**$1.16**	**$1.31**	**$1.71**	**$1.89**	**$2.03**	**$2.57**
Logan	**$0.09**	**$1.33**	**$1.72**	**$1.80**	**$2.06**	**$2.59**
San Jon	**$1.08**	**$1.10**	**$1.70**	**$1.75**	**$2.05**	**$2.58**
Logan/San Jon	**$0.09**	**$0.09**	**$1.73**	**$1.31**	**$2.09**	**$2.62**
Tucumcari	**$1.09**	**$1.11**	**$1.55**	**$1.59**	**$2.11**	**$2.65**

Summary of Alternatives Water Rates Based on Reservation						
			Delay Phase IV			
Phase I-III	$0.31	$0.47	$0.24	$0.55	$2.02	$2.55
All Phases	$1.14	$1.30	$1.68	$1.85	$2.05	$2.58
No Participation	$0.09	$0.09	$0.09	$0.09	$2.63	$3.28
Minimally Participate	$0.20	$0.20	$0.22	$0.20	$2.58	$3.22
** 65 Acre-Feet allocated by Quay County to Subdivision not included in ENMRWS						

8.2.3.3 Recommendations

Based on historical production the water rates for the Quay participants with the exception of the Village of Logan will increase dramatically based on current water usage. The most economical alternative for the City of Tucumcari and Quay County to participate in the ENMRWS is to delay the implementation of Phase IV of the ENMRWS until demand within the City and County increases. The City of Tucumcari and Quay County would also have the option to allow other participants such as the City of Clovis or the City of Portales to utilize by lease or sale part or all of their reservations through the ENMRWS. Delaying Phase IV or not participating fully or at all in the ENMRWS affects the sizing of the Water Treatment Plant and therefore any arrangements for other participants to utilize a portion of their reservations would need to be agreed to as part of the design and implementation of Phase III of the project. The City and the County would still be paying approximately $472,571 and $143,173 annually through Phases I-III. They would need to address paying this annualized amount through an increase in water rates, increasing Gross Receipts Tax (City of Tucumcari has already increased GRT for Water Projects), or other funding mechanisms.

The Villages of Logan and San Jon a would receive the most economical benefit from taking their reservation through the Logan Well Field and applying to the State Engineer for the appropriation of water rights for additional wells needed based on the Ute Reservation amounts. The amount allocated by Quay County to the Logan and San Jon laterals would also be taken through the Logan Well Field, 361 acre-feet.

The Village of House is not a participating member of the ENMRWA. Therefore any benefit the Village would receive from the project would be as a community within Quay County that could use a portion of the County's 1000 acre-feet reservation. A pipeline from either the Storage Tank at the top of the Caprock south of San Jon or from Tucumcari vicinity would need to be constructed with booster pump stations and storage tanks. The costs of the pipeline would be the responsibility of the Village of House and Quay County.

It is definitely in the interest of Quay county to participate and/or support the construction of the ENMRWS. The participating communities and counties have the option of maintaining their reservation by paying the annual $25.00 per acre-foot raw water cost and the $5.60 per acre-foot operation and maintenance fee for Ute Reservoir to the ISC. The communities and Quay County will exercise their option to maintain the reservations by paying the annual costs to ISC. They need to address paying this annualized amount through an increase in water rates, increasing Gross Receipts Tax (City of Tucumcari has already increased GRT for Water Projects), or other funding mechanisms.

The sustainable water resource of 7550 acre-feet per year plus the benefits of the construction through the county and the jobs associated with the ENMRWA will provide a long term economic benefit. The communities within Quay County should be planning for the project and the annualized costs for the administrative, design and environmental work already or soon to be initiated. The Quay County participants definitely support the construction of the ENMRWS to provide sustainable water source based on respective reservations for the participating entities in Curry and Roosevelt counties.
State/federal funding for the ENMRWS is currently being pursued by the ENMRWA.

8.2.3.4 Implementation

The proposed approach to project development and implementation of the ENMRWS is anticipated to take approximately 10 years, from the delivery of the Conceptual Design Report in August 2003, to the completion of planned construction of Phase 4 improvements in October 2013. The main activities envisioned are as follows:

- **Project Development Activities**—July 2003 through January 2011.
  - Funding and supporting activities
  - Pilot treatment testing
  - Public education activities
  - Environmental Investigations and Documentation (National Environmental Protection Act)
  - Preliminary and Final Design
- **Construction Activities**—November 2006 through October 2013
  - Phases 1 though 4
- Delay Phase IV − October 2013 – Date demand is identified

8.3 Develop County and City Ordinances for Conservation

An important aspect of water planning is water conservation, which allows the efficient use of existing resources. Water conservation may be defined as any beneficial reduction in water use or water losses (American Public Works Association, 1981; Prasifka, 1988). Senate Bill 554 was passed and signed into law during the 2003 regular session of the NM Legislature. Senate Bill 554 requires Municipalities Counties and other covered entities to adopt water conservation and drought management plans. This bill requires the covered entities (those who produce and supply over 500 acre-feet annually) to develop, adopt and submit to the state engineer by December 31, 2005 a
comprehensive water conservation plan, including a drought management plan. The City of Tucumcari and the Village of Logan (with the sale of water to San Jon) would be considered a covered entity.

This section discusses methods of addressing municipal water conservation. Municipal conservation will not greatly affect the overall water withdrawals in Quay County, it will provide benefits to individual systems.

8.3.1 Summary of the Alternative

Water conservation ordinances are the obvious choice for water conservation activities. The primary topics covered by conservation ordinances include:

- Prohibiting outdoor water waste (fugitive water) and/or requiring low-water landscapes.
- Changing water rate structures to encourage conservation and reduce water use by residential, industrial, commercial, and institutional customers.

Senate Bill 554 requires the covered entity to consider, and incorporate into its plan if appropriate, at least the following:

(a) water-efficient fixtures and appliances, including toilets, urinals, showerheads and faucets;
(b) low-water-use landscaping and efficient irrigation;
(c) water-efficient commercial and industrial water-use processes;
(d) water reuse systems for both potable and nonpotable water;
(e) distribution system leak repair;
(f) dissemination of information regarding water-use efficiency measures, including public education programs and demonstrations of water-saving techniques;
(g) water rate structures designed to encourage water-use efficiency and reuse in a fiscally responsible manner; and
(h) incentives to implement water-use efficiency techniques, including rebates to customers or others, to encourage the installation of water-use efficiency and reuse measures.

After December 31, 2005, Senate Bill 554 requires that neither the water trust board nor the New Mexico finance authority shall accept an application from a covered entity for financial assistance in the construction of any water diversion, storage, conveyance, water treatment or wastewater treatment facility unless the covered entity includes a copy of its water conservation plan."

8.3.1.1 Water Waste

An ordinance addressing water waste may address many of the issues relating to water conservation. Water waste may be defined as the indiscriminate, unreasonable, or excessive running or dissipation of potable water; and non-essential water use may be defined as the indiscriminate, or excessive dissipation of potable water which is unproductive, or does not reasonably sustain economic benefits or life forms, where there is a shortage of potable water (Monterey Peninsula Water Management District, 1988). The City of Rio Rancho defines Water Waste in their ordinance as;

> *Water Waste. Water waste is the non-beneficial use of water that is supplied by any water supply system within the municipality. Non-beneficial uses of water include, but are not restricted to, the following:*
>
> *1. Landscape water applied in such a manner, rate, or quantity that it regularly overflows the landscaped area being watered and runs onto or seeps into adjacent property or public right-of-way.*
> *2. Landscape water that leaves a sprinkler, sprinkler system, or other application device in such a manner or direction as to spray onto adjacent property or public right-of-way.*
> *3. Washing down of vehicles or hard surfaces such as parking lots, aprons, pads, driveways, or other surfaced areas when water is applied without shut-*

off hose nozzles in an excessive quantity to flow from that surface onto adjacent property or the public right-of-way.

In addition water waste includes the defining and addressing fugitive water which is water that has escaped from one property onto adjacent property or the public right-of-way not including storm water runoff. Besides the loss of potable water, water waste has safety and maintenance impacts. Water running onto streets, especially when it freezes, can cause vehicle accidents and may damage road surfaces.

Various water conservation ordinances are included in Appendix J1. These ordinances includes measures applying to water emergencies and include the following main elements:

- Establishing water conservation levels
- Types of prohibited water waste:
- Water running off an area during landscape irrigation
- Washing of impervious surfaces with a hose (except in cases where it is needed to protect public health and safety)
- Fixing Water leaks within set time frame
- Establishing Landscape watering prescribed hours (e.g., before 10 a.m. and after 6 p.m.)
- Fines and penalties for violations that increase with the number of citations assessed to a property, including:
  - Imposition of a water waste surcharge to any customer in violation
  - Temporary or permanent restriction or discontinuance of flow to a property with recurring violations
  - Exceptions, cure of violations, and refunds of surcharge
  - Administrative appeal process for customers (e.g., appeal to administrative hearing officer, water utility's general manager, or the board of directors)
- An emergency water ordinance can include additional measures such as:
  - Emergency rationing (water allotment to different customer classes)
  - Prioritization of water service according to customer class

Water Conservation ordinances provides for implementation and enforcement by the utility. If a county-wide enforcement system is developed, a certain amount of coordination is needed in developing and enforcing the ordinance.

8.3.1.2 Water Conservation Incentives Through Rate Structuring

Consumers generally respond to price. Generally, a higher water bill leads to lower water consumption over time. Rate structures that charge for the amount of water used, and charge a higher rate for consumption above a certain level (or during a certain period of time) encourage customers to use water efficiently. Many consumers consider water to be essentially “free” and are resistant to paying higher prices. Only when customers understand that rates pay for all the costs of water service – including finding and building new water sources – are they willing to consider higher rates and efficiency measures.

Although consumption-oriented rate structures are an important step in managing water demand, they are most effective when part of a comprehensive conservation package that includes both internal and external measures. Public involvement and education about the rate structure are critical to success. Designing efficiency-oriented water rates that meet revenue requirements and are fair and equitable to all classes of customers is a multi-step process that must address various issues.

Most rate structures generally contain two elements: a fixed service charge and a charge based on consumption. A fixed service charge should reflect the true costs of delivering water and a minimum use charge. The true costs of delivering water include current operating costs, the costs associated with over-sizing the system to meet maximum daily demand, and the costs of developing future sources of water.

Consumption charges that encourage the efficient use of water include:

- *Uniform or Flat Charge rates:* All usage is charged at the same unit rate. Uniform rates send a better pricing signal than declining-block rate structures in which the price of water decreases as the volume of water used increases.
- *Seasonal rates:* This rate structure prices water at different levels by seasons of the year. Generally, seasonal rate structures are designed to reduce summer water use to reflect constraints on water supplies and higher costs during the period.
- *Time of Use rates:* Time of use rates go a step beyond seasonal rates and provide separate charges based on various time periods. Rates may be higher during times during the day or on certain days of the week. Seasonal differences are often incorporated along with hourly rate differences.
- *Inverted block rates:* An inverted-block rate structure separates consumption levels into two or more blocks, with increasing rates for units of water consumption at higher levels of usage. (In addition to encouraging water conservation, this rate structure could help balance the impact of conservation on loss of revenue to the utility.)
- *Excess use rates:* An excess use rate structure involves establishing an average base water usage volume during the non-peak period and a corresponding base water usage rate. During the peak period or season, water usage above the base level is charged at the base rate plus penalty for exceeding the consumption level set.. Several variations of the excess use rate structure exist. More information about these types of rate structuring is provided in Appendix J5.

The communities should analyze which type of water conservation rate structure can achieve conservation effects in their local community. The American Water Works Association's 1998 survey of the residential rate structures of 827 utilities shows approximately 22 percent employing increasing block rates and 2 percent employing seasonal rates. Rate structures should determine the amount of water required for "basic human needs" and kept at an affordable rate for low-income households; thereafter, rates can increase. Appropriately designed programs can mitigate the hardship of rate increases on low-income families. Not only does this have humanitarian benefits, but well-designed affordability programs can also benefit the utilities by avoiding costs associated with late payments, disconnection notices, and service terminations.

Utilities worry that price increases might reduce their sales in an unpredictable manner, leading to less certain revenue streams. A utility must assess the relationships between rates, consumption, and costs, will have on the revenue requirements of the utility. If consumers respond with a higher-than-expected reduction in water use, conservation can cause utilities to experience reduced revenues and an unstable cash flow.

8.3.1.3 Metering

Metering is a very fundamental tool of water system management and conservation.
A regulation, resolution, or ordinance adopted should require the installation and regular reading of meters at all water sources, including import or export points, customer service connections,

and public landscape sites. All water provided free of charge for public use or general community use should also be metered and read at regular intervals to allow the utility to more accurately account for water use.

Figure 8-3. Metering

Universal Metering	← **Advanced Guidelines** →		
	← **Intermediate Guidelines** →		
	← **Basic Guidelines** →		
Measures	▪ **Source-water metering**	▪ **Fixed-interval meter reading**	▪ **Test, calibrate, repair, and replace meters**
	▪ **Service-connection metering and reading**	▪ **Meter-accuracy analysis**	
	▪ **Meter public-use water**		

EPA Water Conservation Plan Guidelines, Appendix A

8.3.2 Technical Feasibility

Implementation of water conservation programs is both technically and legally feasible and has been done throughout the southwest and within New Mexico. An administrative procedure should be set up to enforce the water waste ordinance (write citations and assess fines). The fines associated with water waste violations and number of citations are generally listed in the water conservation ordinances that have been adopted by communities. A videotape of the water flowing off the property should be required of the enforcement officer as a key measure of the enforcement program.

Other challenges associated with water conservation include:

- Mandatory compliance for water waste ordinances can cause resentment if customers perceive them to be excessively restrictive. This can be addressed by a good public relations campaign emphasizing that the guidelines are based on common sense and benefit the whole community.
- Staff training time is required.

8.3.3 Political Feasibility and Social/Cultural Impacts

The ordinances discussed in Section 8.3.1 will only be adopted if local governmental bodies find them politically acceptable. The public is especially aware of scarce water resource issues after a drought, and the elected officials may find more political acceptance during this period of heightened awareness. For the communities in Quay county the ordinances adopted by the Town of Silver City and the City of Las Cruces could serve as a model ordinances. The communities should begin by looking at their rate structures and the development of a voluntary water conservation program. Initial efforts should be focused on conservation education.

8.3.4 Financial Feasibility

The primary financial need associated with implementing a water conservation ordinance is labor. Drafting and implementing a water conservation ordinance requires a staff member to oversee the process and maintain the effort. Utility staff would need to be trained and made available to undertake water waste enforcement duties. Existing field staff could be trained and sworn in as water waste officers if they have several hours available each week. Alternatively, a part-time employee could be dedicated to water waste enforcement. In addition to this

enforcement time, an administrative hearing officer needs to have a small allotment of time associated with appeals. The administrative cost of a program can increase as requirements are set up that need to be enforced.

Other costs include the cost of a video camera to document the waste and costs associated with modifying the billing system to reflect changes in rates, fines for violations, and public education messages. In addition, there are costs associated with installing new meters. Costs to implement a Public Education program would also be appropriate.

8.3.5 Hydrological Impacts

The success of conservation programs varies depending upon the starting point. In Quay County, per-person water consumption. The per capita water use is a representation of water use based on the amount of municipal water that has historically been pumped or diverted divided by population and includes system losses and water used for public facilities.

A 10 percent reduction in use for communities of Quay County could result in the savings shown in Table 8.13.

Table 8-13. Conservation Savings

Community	Acre-Feet
Tucumcari	160
Logan	31
San Jon	6
House	2
Rest of County	13

The total estimated savings resulting from these percentage reductions is ≈212 acre-feet. This savings is small compared to the total withdrawal of surface and groundwater within the county.

8.3.6 Environmental Impacts

Water conservation ordinances can significantly contribute to protection of water resources.

8.3.7 Recommendations and Implementation

The communities within Quay County will be pursuing the development of a Water Conservation Ordinance to be used by individual communities and/or the County as a whole. The ordinance adopted by the City of Silver City will be used as the basic model but the other ordinances included in Appendix F will be reviewed for applicable language to be included. The Communities in Quay County will as members of the Quay Working Group work cooperatively in 2004 to develop the appropriate ordinance for adoption and implementation by the end of 2004.

8.4 Agricultural Conservation

An important aspect of water planning is water conservation, which allows the efficient use of existing resources. The agricultural sector is the largest water user in Quay County (Section 6.1). The steering committee and the public identified agricultural water conservation as a key

issue. The agricultural water conservation plan prepared by the Arch Hurley Conservancy District is included in Appendix H.

Water Efficiency Measures for Agricultural Districts outlined by the United States Environmental Protection Agency include:

- Provide adequate water measurement and accounting.
- Adopt water pricing structure that encourages efficiency.
- Provide information and education services for water users.
- Designate a water efficiency coordinator.
- Encourage on-farm water management measures such as:
  - ditch lining
  - development of water reuse systems
  - installation of surge valves and gate pipes
  - sprinkler system
  - field leveling
  - soil treatments
- Incentives for on-farm water efficiency measures include in-kind services, educational programs, demonstration projects, and financial incentives, including tax incentives, low-interest loans, equipment purchase subsidies, and water charge discounts or rebates.

Senate Bill 128 was enacted and signed into law during the 2003 regular session of the NM Legislature. Senate Bill 128 protects an individual's water rights to water not used as a result of agricultural conservation practices. "Improved irrigation methods resulting in the conservation of water shall not affect an owner's water rights."

8.4.1 Summary of Agricultural Conservation Plan

The AHCD conservation plan includes a summary of problems which present opportunities for conservation. These problems are summarized as follows;

- Water Loss
  - Difference in water delivered versus water released
  - Aquatic vegetation alongside and within canals
  - Wet sub-irrigated areas in fields
  - Seepage from laterals and canals
  - Large amount of carry water needed for some sub-laterals
- System Operation and Maintenance
  - Some on-farm measurement devices in disrepair or non-existent
  - Maintenance equipment in need of replacement
  - Operational vehicles in need of replacement
  - Fences and other obstructions across canals banks
  - Oversized canals and laterals
  - Excess and large vegetative growth within and along canals
  - Sediment deposition in canals
  - Eroded and rough sub-laterals
  - No significant capital improvements initiated in recent years
  - Serious farm income short-falls restricting farmers ability to pay for improvements
- Irrigation Efficiency
  - Uneven crop growth
  - Low Yields
  - Field runoff

The AHCD agriculture conservation plan also provides goals for water management. The goals listed are as follows:

- Reduce System Water Loss to Less than 40% of Gross Diversion by the Year 2020
  - Implement a measurement program with the installation of one accurate measurement device per year at critical locations in the delivery system
  - Train ditch riders in basic hydraulics and water management during the off-season
  - Evaluate the financial feasibility of small laterals improvement
  - Evaluate water quality from Tucumcari Lake and perform a feasibility study of pumping water from the Tucumcari and Dry Lakes.
  - Implement a 10-year delivery system improvement program to resize the most critical delivery canals and laterals. Also reduce the use of dredging equipment in lieu of alternative methods of weed control such as mowing, grazing and application of herbicides.
  - Make use of the wye regulating reservoir
  - Evaluate concrete lining or installing pipe in the most critical reaches of the delivery system.
- Improve System Operation and Maintenance
  - Replace defective or non-existent measuring device at farm turn-outs
  - Evaluate and prioritize critical maintenance requirements for the system and equipment
  - Train all equipment operators in proper canal maintenance procedures.
- Promote On-farm Efficiency
  - Offer on-farm irrigation water management training through seminars to improve irrigation efficiency. Coordinate with other agencies on training.
  - Initiate on-farm tail water recover and reuse.
  - Encourage use of ISC water conservation loan program
  - Develop drought contingency plan
- Develop Financing to Provide for High Cost Water Conservation Practices
  - Determine and quantify district fiscal needs
  - Initiate an aggressive grant search program and apply for at least one private and one government grant annually
  - Partner with USDA and Dept. Of Interior agencies on a continuing basis to reinstate cost sharing programs and funding
  - Participate in USBOR Water conservation Field Services Program on and annual basis to implement water management measures such as water measurement and small lateral improvement.
- Education and Information
  - Public information through monthly/bi-monthly news releases.
  - Presentations to local groups on AHCD activities.
  - Conduct tours of AHCD operations and infrastructure for interested parties.
  - Prepare and maintain traveling exhibit of AHCD for setup at local fairs and events.

8.4.2 Feasibility

Implementation of the agricultural conservation plan is technically and legally feasible.
The real issue which is discussed in the Agricultural Conservation Plan is costs and where the funding may be found to implement the plan. AHCD plans to apply for public and private grants to help fund the conservation plan.

8.4.3 Recommendations and Implementation

The communities within Quay County will support the implementation of the AHCD Agricultural Conservation Plan. The lining of the Conchas Canal is important to the city of Tucumcari so

that recharge of the water producing aquifers is not impaired by the work. The City will be coordinating and cooperating with AHCD in development of the project.

8.5 Drought Planning

Drought planning within Quay County should be developed in coordination with the State Drought Task Force and following the guidelines of the State Drought Task Force. In addition the National Drought Mitigation Center has The Basics of Drought Planning: A 10-Step Process by *Donald A. Wilhite, Michael J. Hayes, Cody Knutso, and Kelly Helm Smith* on their website at www.drought.unl.edu. The 10 steps are as follows;

10 Steps for Drought Planning

1. Appoint a Drought Task Force
2. State the Purpose and Objectives of the Drought Plan
3. Seek Stakeholder Participation and Resolve Conflict
4. Inventory Resources and Identify Groups at Risk
5. Develop Organizational Structure and Prepare Drought Plan
6. Integrate Science and Policy, Close Institutional Gaps
7. Publicize the Proposed Plan, Solicit Reaction
8. Implement the Plan
9. Develop Education Programs
10. Post-Drought Evaluation

8.5.1 DROUGHT TASK FORCE

A Quay County Drought Task Force should be formed to oversee the implementation of drought-preparedness activities in the County. The Task Force would assume the lead role in drought preparedness, response coordination and media information releases.

8.5.2 DROUGHT TASK FORCE WORK GROUPS

The State of NM currently has five Work Groups which meet regularly to evaluate sector-specific drought vulnerabilities and recommend mitigation activities. Additional work groups are planned to be established over the next year, including a Water Development Work Group. The County should organize its task force and establish work groups along the lines of the State organization;

- **Monitoring Work Group**

  The Monitoring Work Group of the DTF is responsible for monitoring all available climatological data, soil moisture readings, reservoir storage levels, and other pertinent information necessary to analyze the current status of drought conditions in the State of New Mexico. The group also examines and reports on long-term forecasts to assist the DTF in their preparedness and response actions. As necessary, the MWG issues "notices" based on various stages of drought that trigger actions by the DTF. The county should initiate a monitoring work group responsible for coordinating with the State DTF to monitor drought conditions and assist the county in their preparedness and response actions.

- **Drinking Water Work Group**

  The Drinking Water Work Group has a broad spectrum of responsibilities for mitigation and response, working to prevent community water systems from reaching emergency status through improved planning (including conservation and drought contingency

plans) and by identifying new opportunities for collaboration. The group also identifies methods for the domestic, commercial, and industrial sectors to reduce water use, through the use of techniques such as market-based incentives, changes in land-use regulations, and increased education and technical assistance, and makes recommendations to the DTF for policy that may assist with water conservation in those sectors.

- **Agriculture Work Group**

  The Agriculture Work Group includes focuses their mitigation and response efforts on the impacts of drought to the agricultural sector. The length and degree of intensity of drought can produce profound impacts on the county's agricultural interests. Farmers and ranchers, historically, have been the most visibly affected by drought and numerous federal assistance programs are available for the agricultural sector.

- **Wildlife and Wildfire Work Group**

  The Wildlife and Wildfire Work Group focuses on the interrelated impacts of drought on local wildlife and forests. Drought greatly increases wild land fire danger and the probability of large fires can have catastrophic effects on watersheds and threaten communities. Increased fire restrictions can negatively impact rural economies. Drought reduces vegetative health and increases susceptibility to outbreaks of insects and disease. In addition, wildlife often suffer from lack of forage, increasing competition with livestock on rangelands. Fish and riparian areas also suffer during droughts. Low stream flows during drought can increase threats to endangered and threatened fish species..

- **Recreation, Economic Development, and Tourism Work Group**

  The Recreation, Economic Development, and Tourism Work Group has not yet become active but will include representatives from tourism, economic development, and parks agencies and organizations. The group assesses the impacts of drought, recommends new initiatives, and will assist with preparedness for and mitigation of drought impacts on recreation, tourism, and the County economy. The tourism industry represents a significant sector of the overall economy, particularly with respect to the skiing and recreational opportunities available in the county. Tourism and the livelihood it brings to many in Quay County can be negatively impacted by drought. The state's economy, in general, can be dramatically impacted by drought, making the work of this group very important.

- **Water Development Work Group**

  Identifying and developing new sources of water will be important to the continued viability of the County. Particularly in times of drought, alternatives to surface water are critical, as are new sources of groundwater to offset or avoid excessive depletions. Wastewater treatment as an option for extending the life of existing water supplies should be evaluated

8.5.3 Drought Task Force Work Group Priorities

Each County Work Group shall identify priorities and initiatives for 2004 and beyond. These priorities and initiatives will require considerable research as well as development of policy, ordinances, and funding recommendations that can be discussed by the DTF.

8.5.4 Recommendations and Implementation

The communities within Quay County will establish in 2004 a County Drought Task Force to work with State Drought Task Force to monitor and address drought related conditions and issues within Quay County.

8.6 Water Rights Transfers or Leases that Could Supply Projected Demand

The purpose of this alternative is to pursue water rights transfers or leases that would enable the County or communities to continue to meet demands or mitigate drought related shortages. Identifying water rights for sale, lease, or to option before the water is needed is an alternative that merits serious consideration. Addressing water rights transfers now facilitates planning and enables quick responses to water issues resulting from drought conditions. In addition, priority water rights may be established in case other entities (private or public) out of the county begin to purchase or lease water rights in Quay County to supplement their water supply.

Water banking is a mechanism used in some western states which can facilitate water transfers. In New Mexico, water banking was approved by the 2002 NM Legislature. The bill restricts water banking to a 200-mile stretch of the lower Pecos below Sumner Lake, places a three-year time limit on the experiment, lets the Interstate Stream Commission make the rules. The results of the experimental legislation will determine the future and availability of water banking to the communities of Quay county as a future mechanism of water management.

8.6.1 Technical Feasibility

The technical feasibility issues associated with pursuing water rights transfers include:

- Identifying water rights holders that would be interested in selling, leasing, or optioning their water rights.
- Identifying water rights that are located in an acceptable location for the proposed purpose of use by the community. The It would need to be determined that the water right can provide a dependable water supply.
- The process required to apply for a change in ownership, place and/or purpose of use.
- Any protests that may occur in response to an application must be addressed. Simple or complex hydrologic models may be necessary to demonstrate that there is no impairment or impact from the transfer.

8.6.2 Identifying Available Water Rights.

Identifying water rights available for purchase or lease can be difficult. Water rights transfers within the boundaries of special districts are not subject to OSE approval (NMSA 73-14-47 and 73-13-4). Water Rights transfers within the AHCD are accomplished informally through AHCD water users who know each other. The AHCD is a first point of contact in a search for irrigation water rights available for lease or transfer.

The Waters Database administered by the Office of the State Engineer is an excellent reference for anyone desiring to identify water right holders by location. Purchasers or lessees may also use water brokers or water attorneys to find willing sellers.

Temporary transfers of up to 3 acre-feet are allowed under New Mexico law. However, this limited amount would be insufficient to meet public water supply or irrigated agriculture needs. Table 8-13 lists the wells and corresponding water rights listed in Quay County in the Waters Database that could present the communities with the opportunity to transfer water rights for municipal purposes. The City of Tucumcari is in Township 11N Range 30E; The Village of Logan is in Township 13NRange 33E; The Village of San Jon is in Township 11N Range 34E; and The Village of House is in Township 5N Range 29E (shown in red in Table 8-14).

Table 8-14. Non-Domestic/Municipal Wells within Quay County

DB File Nbr	Use	Diversion	Owner	Well Number	Tws	Rng	Sec
FS 00595	IRR	5760	LYONS RANCH	FS 00594	07N	28E	15
				FS 00595	07N	28E	15
FS 00613	IRR	300	JAMES F. MORROW	FS 00613	05N	29E	33
FS 00614	IRR	336	LOUIS W. MCDANIEL	FS 00614	06N	29E	19
FS 00615	IRR	159	G. B. IRWIN	FS 00615	06N	28E	24
FS 00616	IRR	120	DAVID M. FRAIZER	FS 00616	05N	29E	20
FS 00617	IRR	140	GLENN BASS	FS 00617	06N	28E	24
				FS 00618	06N	28E	24
FS 00618	IRR	140	GLENN BASS	FS 00618	06N	28E	24
FS 00619	IRR	120	ASA G. PASCHALL	FS 00619	05N	29E	20
FS 00835	IRR	1000	SHOEMAKER RANCH	FS 00835	07N	28E	9
				FS 00836	07N	28E	9
FS 00837	IRR	600	SHOEMAKER RANCH	FS 00837	07N	28E	10
FS 00888	IRR	600	GLEN R. FRANKLIN	FS 00888	05N	29E	4
FS 00896	IRR	300	BURK RANCH INC	FS 00896	05N	30E	21
FS 00897	IRR	100	BRUCE RUNYAN	FS 00897	05N	29E	12
FS 00901	IRR	40	BRUCE RUNYAN	FS 00901	05N	29E	23
FS 00903	IRR	100	BRUCE RUNYAN	FS 00903	05N	29E	23
FS 00905	IRR	50	BRUCE RUNYAN	FS 00905	05N	29E	23
FS 00907	IRR	20	BRUCE RUNYAN	FS 00907	05N	29E	25
FS 00910	IRR	20	BRUCE RUNYAN	FS 00910	05N	29E	26
FS 00914	IRR	25	BRUCE RUNYAN	FS 00914	05N	29E	13
FS 00915	IRR	50	BRUCE RUNYAN	FS 00915	05N	29E	13
FS 00916	IRR	50	BRUCE RUNYAN	FS 00916	05N	29E	13
FS 00917	IRR	50	BRUCE RUNYAN	FS 00917	05N	29E	13
FS 00922	IRR	30	BRUCE RUNYAN	FS 00922	05N	30E	32
FS 00924	IRR	50	BRUCE RUNYAN	FS 00924	05N	30E	36
FS 00928	IRR	40	BRUCE RUNYAN	FS 00928	06N	29E	5
FS 00972	IRR	160	CALVIN E. AND BEVERLY K. MORGAN	FS 00972	05N	28E	1
FS 00989	IRR	350	GENE ROBBERSON	FS 00989	05N	29E	6
				FS 00990	05N	29E	6
				FS 00991	05N	29E	6
				FS 00992	05N	29E	6
FS 01009	IRR	720	MAURICE RUNYAN	FS 01009	05N	29E	5
				FS 01009 S	05N	29E	5
				FS 01009 S-2	05N	29E	6
				FS 01009 S-3	05N	29E	6
				FS 01009 S-4	05N	29E	6
				FS 01009 S-5	05N	29E	6
FS 01010	IRR	450	MAURICE RUNYAN	FS 01010	06N	29E	31
				FS 01010 S	06N	29E	31

DB File Nbr	Use	Diversion	Owner	Well Number	Tws	Rng	Sec
				FS 01010 S 2	06N	29E	31
				FS 01010 S 3	06N	29E	31
				FS 01010 S 4	06N	29E	31
FS 01032	IRR	2160	TERRY LEWIS	FS 01032	07N	28E	16
FS 01038	IRR	480	TERRY LEWIS	FS 01038	07N	28E	31
FS 01094	IRR	264	FOURELL INC.	FS 01094	05N	29E	20
				FS 01094 S	05N	29E	20
				FS 01094 S-2	05N	29E	20
FS 01095	IRR	264	FOURELL INC.	FS 01095	05N	29E	20
				FS 01095 S	05N	29E	20
				FS 01095 S-2	05N	29E	20
FS 01096	IRR	308	FOURELL INC.	FS 01096	05N	29E	20
				FS 01096 S	05N	29E	20
FS 01097	IRR	374	FOURELL INC.	FS 01097	05N	29E	14
				FS 01097 S	05N	29E	15
				FS 01097 S-2	05N	29E	15
				FS 01097 S-3	05N	29E	14
				FS 01097 S-4	05N	29E	14
FS 01098	IRR	264	FOURELL INC.	FS 01098	05N	29E	8
				FS 01098 S	05N	29E	8
				FS 01098 S-2	05N	29E	8
FS 01117	IRR	40	DONNIE R. OR ELVERNA R. SPARKS	FS 01117	05N	29E	27
FS 01250	IRR	60	AKIN & AKIN, INC	FS 01250	06N	29E	2
FS 01251	IRR	120	AKIN & AKIN, INC.	FS 01251	06N	28E	2
TU 00111	IRR	60	ALVIN LEM CHESHER	TU 00111	11N	30E	22
TU 00191	IRR	45	L. C. STRAWN	TU 00191	12N	30E	32
TU 00259	IRR	13.6	MAURICE MARCHBANKS	TU 00259	13N	33E	7
TU 00260	IRR	240	RICKY PURCELL	TU 00260	12N	35E	31
TU 00261	IRR	240	RICKY PURCELL	TU 00261	12N	35E	31
TU 00262	IRR	240	RICKY PURCELL	TU 00262	12N	35E	31
TU 00276	IRR	300	RINESTINE RANCH, INC.	TU 00276	16N	34E	33
TU 00321	AGR	240	JAMES E RINESTINE	TU 00321	16N	34E	33
TU 00338	IRR	240	JAMES RINESTINE	TU 00338	16N	34E	33
TU 00725	IRR	120	BOBBY D. WHITE	TU 00725	11N	30E	24
TU 01003	IRR	21.54	O.O. AND MILDRED, JR O	TU 01003	13N	33E	8
TU 01271	IRR	150	DANIEL L RUBENTHALER	TU 01271	12N	34E	25
TU 01272	IRR	150	DANIEL L RUBENTHALER	TU 01272	12N	34E	25
TU 01273	IRR	150	DANIEL L RUBENTHALER	TU 01273	12N	34E	25

DB File Nbr	Use	Diversion	Owner	Well Number	Tws	Rng	Sec
TU 01274	IRR	150	DANIEL L RUBENTHALER	TU 01274	12N	34E	25
TU 01275	IRR	13	DANIEL L RUBENTHALER	TU 01275	12N	34E	25
TU 01276	IRR	150	DANIEL L RUBENTHALER	TU 01276	12N	34E	25
TU 01277	IRR	150	DANIEL L RUBENTHALER	TU 01277	12N	34E	25
TU 01303	IRR	500	JOHN R WINTER	TU 01303	11N	35E	23
TU 01304	IRR	900	JOHN R WINTER	TU 01304	11N	35E	23

8.6.3 Recommendations and Implementation

Each of the communities within Quay County will be pursuing the identification and acquisition of available water rights to supplement the existing declared water rights for the community. The communities are not in immediate need of additional water rights but will work to protect the available water within their areas to assure sustainable supplies for the 40 year planning period.

8.7 Appropriate and Reserve Groundwater for the Region

Appropriating available groundwater resources would increase the supply available to the county and protect water supplies from appropriation by neighboring counties, regions or states. New Mexico law allows for certain types of water providers and local governmental entities to appropriate water for future use as part of the long-term planning process. Generally water users who obtain a permit from the OSE to appropriate groundwater or surface water must put the water right to beneficial use within four years or are subject to forfeiture of the right after receiving notice from the OSE. A municipality, county or other qualifying applicant may reserve water rights for up to 40 years without putting them to beneficial use if a 40-year water plan that demonstrates a future need for the water has been completed (NMSA 72-1-9).

8.7.1 Technical Feasibility

This alternative consists of submitting applications to obtain permits to use (appropriate) groundwater that is unappropriated and available in the region. This discussion analyzes the potential for appropriating groundwater in both declared and undeclared basins within the county. To identify specific wells or well field locations where a diversion might take place, further technical studies would be necessary.

Certain eligible entities such as Tucumcari and Logan may wish to pursue individual applications, especially since they are located near groundwater supplies with the potential to be appropriated and developed. A cooperative approach among various eligible entities (Logan, San Jon and Quay County) would allow the costs for developing the wells or well field and conveyance structures to be shared among multiple users. Such an approach would also expand the capacity to secure funding through various types of funding mechanisms.

8.7.1.1 Appropriation in Declared and Undeclared Basins

New Mexico statutes define the process for appropriating waters of the state in declared basins. Most of Quay County falls within the Tucumcari or Fort Sumner basins (Section 5.2). A small

portion of the county is undeclared and does not fall under the jurisdiction of the OSE. In declared basins, the OSE must determine that water is actually available for appropriation and that the proposed application will not impair existing water rights and will not be contrary to public welfare or conservation.

The OSE does not administer undeclared basins. Until the OSE declares the area part of a declared groundwater basin and exercises jurisdiction of the area, the priority system of allocating water and protecting existing water rights is not in place. Individuals or communities within the area do not need to complete an application or follow an administrative process to drill a well and begin pumping water. The disadvantage of developing rights in an undeclared basin is that existing water rights would not be protected against subsequent development. Part of the process and would not evaluate the new wells for impairment or public welfare implications by a water development project. In addition, existing users would not be provided with any notice of potential water development projects.

Incorporation of the undeclared portions of Quay County into declared basins by the OSE would allow for the administration of water in the entire county. Existing water users would be able to declare their water rights and establish their seniority over subsequent development. Such a declaration would allow the region to monitor out-of-state/region/county efforts to appropriate local water supplies. The declaration would also assist the Quay County with monitoring the water use in the Forrest and Nara Visa areas in order to assure an adequate water supply in those unincorporated communities.

8.7.1.2 Process for Declaring an Underground Basin

An underground water basin must be determined to have reasonably ascertainable hydrologic or land division boundaries. The OSE may declare underground water basins by Special Orders without prior notice.

The OSE must within ten days of promulgating the order set a date for a public hearing and provide the public with adequate notice of the hearing. The proposed manner for administration of the basin generally is presented for public comment. Considerations may include how to:

- Benefit of developing the resource
- Reasonable economic life for the basin
- Prevent depletion of any connected surface waters

To develop and implement the proposed basin administration, detailed knowledge of the hydrology of the basin is necessary. After a basin has been declared and a public meeting has been held, the OSE can rule that the basin is closed to further appropriation. Regardless, the OSE must still grant permits for domestic and stock wells.

8.7.1.3 Opportunities for Appropriation in Quay County

The ability and willingness to develop groundwater supplies will be determined by the quality and amounts of groundwater available. An applicant has filed an application numbered TU-1385 with the State Engineer for Permit To Appropriate the Underground Waters of the State of New Mexico within the Tucumcari Underground Water Basin in Quay County by drilling a well in the Southwest ¼ Northwest ¼ Southwest ¼ of Section 11, Township 11 North, Range 30 East, New Mexico Principal Meridian, 100 feet deep with a 10-inch casing to be located on land owned by the applicant, for the appropriation of 160 acre-feet per annum for irrigation purposes on 70-acres of land. The new well will be physically located approximately 1-mile northwest of Tucumcari City Hall and 0.5 mile west of Highway 104. This application is an example of the

technical feasibility of appropriating underground waters for the City of Tucumcari and Quay County. The continuation of drought conditions and the lack of irrigation water from Conchas Reservoir may cause more farmers within AHCD to apply to appropriate underground waters within AHCD and in close proximity to the City of Tucumcari.

8.7.2 Political Feasibility and Social/Cultural Impacts

Developing water supplies for future use is a viable mechanism for protecting the county and supporting existing and future uses. Developing water supplies by appropriation does not involve removing water from existing uses and transferring it to new uses. There should be no major political impediments to appropriating unappropriated groundwater.

Proposed individual wells or well fields could affect existing users and may result in either a protest or, in the case of the undeclared areas, political opposition. In pursuing groundwater supply development, existing users within the area should be identified and consulted.

8.7.3 Financial Feasibility

The greatest expense in developing water supplies is related to the hydrologic investigations and models that may be necessary to obtain approval from the OSE. In addition, feasibility studies, wells, and conveyance structures will need to be funded and constructed. Hydrologic investigations are necessary to identify the exact location of favorable groundwater resources and sites for wells or well fields. This plan provides an overview of existing knowledge of groundwater supplies did not involve the collection of new data. To obtain the site-specific data required to evaluate the feasibility of a groundwater appropriation, applicants may need additional information including existing well logs, interviews with adjacent well owners, test wells and water quality samples from selected locations.

If an application to appropriate groundwater is protested, the applicants will be required to prove that the appropriation would not impair existing rights. A study to support the appropriation may be a simple analytical model or may require a more complex hydrological model. Costs for required studies can range from $50,000 to $200,000.
If a pipeline is needed to bring a new water supply into use, engineering and environmental studies will also be required. The cost for constructing a pipeline would be considerable.

8.7.4 Hydrological Impacts

Unappropriated water supplies in declared basins would be available for transfer outside of the county, unless protected. Appropriation of any water in declared basins that is not stream-connected represents a net gain of water for the County.

8.7.5 Environmental Impacts

There should not be a negative environmental impact from reserving groundwater supplies for future uses within the region. The development of groundwater through the installation of new wells and the subsequent construction of pipelines to convey water could have potential environmental implications and may require the completion of an environmental assessment.

8.7.6 Recommendations and Implementation

Each of the communities within Quay County will be pursuing the identification and appropriation of available water rights to supplement the existing declared water rights for the community. The communities are not in immediate need of additional water rights but will work to protect the available water within their areas to assure sustainable supplies for the 40 year planning period. The City of Tucumcari and The Village of Logan appear to have the most opportunity to appropriate additional water from the water bearing formations near their respective communities.

8.8 Develop and Implement County and Municipal Septic Tank and Other Water Quality Control Ordinances

This alternative addresses protection of water resources and water quality. The primary mechanisms for protecting water quality through ordinances are:

- Regulating the location and type of on-site (septic or alternative) wastewater treatment systems that will be allowed.
- Providing for wellhead protection areas to protect drinking water supply wells from potential contaminant sources.
- Regulating the design and location of subdivisions or other new construction to ensure logical development of infrastructure and provide for adequate drainage and fire protection, thus protecting water supplies from erosion, sedimentation, or other contamination.
- Limiting domestic wells and septic tanks in high-density areas, to limit exposure to contaminated groundwater.
- County-specific regulations could also incorporate other features such as setting forth requirements for connecting to wastewater treatment systems.

A major water quality concern in Quay County is the proliferation of septic tanks in high-growth areas such as Logan which is adjacent to Ute Reservoir. The Village of Logan is currently contracted with the Larkin Group to evaluate the costs and benefits of extending sewer service west from the village to most of the residents within the village. The current sewer system only serves the area of Logan immediately adjacent to US 54. The Village is concerned with the contamination of Ute Reservoir from the septic tank systems adjacent to the reservoir.

8.8.1 Summary of Wastewater Options

Several types of wastewater treatment and disposal (or reuse) methods are used:

- On-site septic tank/leach field systems
- Alternative on-site systems
- Decentralized (cluster) wastewater treatment systems
- Centralized wastewater treatment facility

These treatment methods are described in Sections 8.8.1.1 through 8.8.1.4.

8.8.1.1 Septic Tank Systems

A septic system is a self-contained underground wastewater treatment system. Because septic systems treat and dispose of household wastewater onsite, they are often more economical than centralized sewer systems in rural areas where lot sizes are larger and houses are spaced

widely apart. Septic systems are simple in design, which make them generally less expensive to install and maintain.

A septic system consists of two main parts-a septic tank and a drain field. The septic tank is a watertight box, usually made of concrete or fiberglass, with an inlet and outlet pipe. Wastewater flows from the home to the septic tank through the sewer pipe. The septic tank treats the wastewater naturally by holding it in the tank long enough for solids and liquids to separate. The wastewater forms three layers inside the tank. Solids lighter than water (such as greases and oils) float to the top forming a layer of scum. Solids heavier than water settle at the bottom of the tank forming a layer of sludge. This leaves a middle layer of partially clarified wastewater.

The layers of sludge and scum remain in the septic tank where bacteria found naturally in the wastewater work to break the solids down. The sludge and scum that cannot be broken down are retained in the tank until the tank is pumped. The layer of clarified liquid flows from the septic tank to the drain field or to a distribution device, which helps to uniformly distribute the wastewater in the drain field. A standard drain field (also known as a leach field, disposal field, or a soil absorption system) is a series of trenches or a bed lined with gravel or course sand and buried one to three feet below the ground surface. Perforated pipes or drain tiles run through the trenches to distribute the wastewater. The drain field treats the wastewater by allowing it to slowly trickle from the pipes out into the gravel and down through the soil. The gravel and soil act as biological filters.

Septic tanks basically function as clarifiers and biological treatment systems; they settle solids and rely on anaerobic or facultative microorganisms to biodegrade organic wastes. Conventional septic tanks and leach fields also include follow-on physical and biological treatment in receiving soils. The technology is well established, and when properly applied, designed, and installed, it provides a known and cost-effective level of wastewater treatment as well as adequate protection for receiving groundwater in many cases. However, if tanks are improperly installed and/or are not maintained, they may leak and cause groundwater contamination.

8.8.1.2 Alternative Systems

Alternative on-site systems can consist of a wide range of treatment systems, the most common of which are:

- Constructed wetlands
- Sand filters
- Peat filters

Constructed wetlands use wetland plants, soils, and their associated microorganisms to remove contaminants from wastewater and other sources. Constructed wetlands treatment systems are capable of providing treated wastewater suitable for reuse or reclamation. There are two types of wetlands, free water surface (FWS) wetlands or submerged flow wetlands (SF). FWS are usually not used for individual residences. Wetlands can be used to treat a variety of wastes, such as wastewater, acid mine drainage, agricultural and non-point discharges, and storm water treatment and retention. The major advantage of using a subsurface flow wetland is that the wastewater stays below the gravel surface. This decreases or eliminates exposure to wastewater, odor, and insect vectors. Another advantage is that they are smaller in size than FWS wetlands. Constructed wetlands optimize the same processes that are found in natural wetlands: filtration, sedimentation, physical and chemical immobilization, and chemical and biological decomposition. As a natural system, the processes are complex and not thoroughly

understood. However, years of research worldwide has shown that constructed wetlands can treat wastewater effectively.

Sand filters have been used in the United States for over 100 years. Design has improved significantly in the 1990's. They are a type of aerobic system, meaning they are oxygen rich. In addition to physically filtering the water, they perform as a biological filter. Microorganisms, highly adapted to decomposing wastewater, live on the sand grains. These organisms convert much of the carbon or organic matter in the wastewater to carbon dioxide (CO_2). They also convert ammonia (NH_3) and organic N to nitrate (NO_3^-). If the filter recirculates, then the nitrate will pass from the sand filter into an anaerobic or oxygen deplete environment in the recirculation tank. This allows denitrification, or the transformation from nitrate (NO_3) to nitrogen gas ($N_{2(g)}$). Nitrate may be reduced partially to nitrite or completely to nitrogen gas. Complete reduction requires an organic carbon source, which is usually abundant in the septic tank effluent. Recirculating sand filters have the advantage of being a technology capable of significant nitrogen reductions (USEPA & Purdue Research Foundation, 1999).

Sand filters have been used where conventional septic tank/absorption field systems have failed. They are a good option for sites with high groundwater, shallow bedrock, poor soils, or other restrictions. Sand filters have also been used where centralized treatment is unavailable or too expensive for homes, businesses, institutions, and small residential developments/communities(USEPA & Purdue Research Foundation, 1999). .

Many variations of the sand filter technology exist, but every type of sand filter includes a few basic design and operating principles:

- The wastewater is pretreated to remove solids and scum in order to mitigate clogging in the sand filter. Pre-treatment of household wastewater usually takes place in a septic tank, typically using screens to ensure that solids do not carry over into the sand filter.
- After the solids have been removed, a pump regulated with a timer doses wastewater to the sand filter in timed intervals. This intermittent application allows the media to drain between doses, ensuring that oxygen (which is critical to the biological and chemical treatment processes that take place inside the filter) is introduced into the filter with each dose of wastewater.
- After passing through the sand media, the wastewater is collected in an under drain where it flows to the soil for final polishing and subsurface dispersal.

Sand Filter Advantages and Disadvantages (USEPA & Purdue Research Foundation, 1999).

Sand filters have several advantages:

- Treatment processes are well understood
- Several designs available
- They provide relatively consistent treatment
- They are relatively compact (recirculating sand filters are smaller than single pass sand filters)
- Useful for individual and community/cluster systems
- They have been used to renovate failed systems (in other states)

They also have considerations:

- Professional maintenance every 6-12 months is required

- Current design recommendations require sand (or crushed glass) of a very specific size. This may be difficult to find in certain areas.
- A water tight septic tank is absolutely necessary
- The system requires both electricity and an alarm system

A peat septic system functions much like a conventional septic system with the exception that the wastewater receives treatment by being filtered through 2 to 3 feet of peat before being discharged to the soil for final disposal. Water from the dwelling first flows to a conventional septic tank where solids settle. The clarified effluent then flows, either by gravity or by pump, to the peat filter. The peat acts much like a sponge, absorbing and wicking the effluent in all directions and providing treatment as the wastewater slowly filters through the peat. Eventually the effluent filters to the bottom of the peat where it percolates into the soil for final disposal. Experimental results show that peat filters are capable of very efficient removal of fecal coliform bacteria, biochemical oxygen demand (BOD) and total suspended solids (TSS). They also appear to be capable of a producing a significant loss of total nitrogen in finished effluent.

8.8.1.3 Decentralized and Centralized Wastewater Treatment Systems

Decentralized and centralized wastewater treatment systems use similar treatment technologies but differ in size and treatment capacity. A centralized wastewater treatment system treats an entire population area, typically a town or city, while a decentralized wastewater treatment system is a smaller-scale system serving a limited number of residences or other buildings. Decentralized systems are typically used in remote or isolated areas where the cost and logistics of connecting to a centralized wastewater infrastructure are prohibitive.

These systems can either be prefabricated or constructed in place depending on the required capacity of the wastewater treatment plant. The processes for these systems include physical, biological, and chemical treatment of domestic wastewater by using a combination of screens, filters, tanks, and basins. Final disposal of treated effluent can include the following:

- Discharge to surface water (e.g., a river)
- Subsurface disposal
- Reuse

8.8.2 Technical Feasibility

While each type of wastewater treatment system has merit, site conditions and population served typically dictate which system is more feasible for a particular area. Technical feasibility for each wastewater treatment system type is discussed in Sections 8.8.2.1 through 8.8.2.4. The technical feasibility of wellhead protection and subdivision ordinances is discussed in Sections 8.8.2.5 and 8.8.2.6, respectively.

8.8.2.1 On-Site Septic Tank Systems

A conventional septic system, consisting of a tank and drain field, treats wastewater at its source. But, older septic systems that were built without thought of adequate soil depth and/or that have not been properly maintained can fail, leading to surface and groundwater contamination. This potential for failure most often results from neglect of maintenance or inappropriate drain field siting. On-site septic tank systems are commonly used systems that in some cases provide adequate treatment for domestic wastewater in a cost-effective manner.

They are technically feasible to install on most properties, but are generally used in areas of low housing density. A technical limitation to septic tank systems is the need for additional treatment in areas with relatively impermeable soil, shallow bedrock, and/or a high water table. Additional treatment methods are also required for high-strength wastewater, which is typically generated only by commercial or industrial facilities. Standard construction procedures are used for system installation, and some maintenance is required.

Septic tank effluent is typically disposed of below ground through a gravel-filled disposal/dispersal (leach) field. The homeowner is generally responsible for operation and maintenance (O&M), which typically includes pumping the septic tank every one to five years using an approved septage hauler, who also removes solids for disposal at an approved facility.

The minimum lot size for conventional septic systems in New Mexico is currently ¾ acre. Previously platted lots less than ¾ acre have been "Grandfathered" under the Liquid Waste Disposal Regulations (LWDR). NMED has issued a memorandum that states that permit applications for undeveloped lots that are less than ¾ acre, and that are in an area with a highly vulnerable body of water, will be evaluated more carefully pursuant to LWDR 20.7.3.200.A.6 (NMAC). The applicant may be required to install a system other than a conventional system, which may include an advanced treatment system, to ensure there is no degradation of a body of water.

NMED has determined, based on hydrogeologic studies and case investigations in New Mexico, that highly vulnerable bodies of water include the following:

- A water-table aquifer (includes both unconfined and semi-confined conditions) with a vadose zone thickness of 100 foot or less containing no soil or rock formation that would act as a barrier to saturated or unsaturated wastewater flow;
- an aquifer with known anthropogenic anoxic or nitrate contamination;
- an aquifer overlain by fractured bedrock;
- an aquifer in karst terrain; or
- an alluvial aquifer that discharges to a gaining stream located within 200 feet of the proposed disposal-field or seepage-pit location.

The additional scrutiny by NMED will not be applied to existing permitted systems on lots less than ¾ acre, including permit modifications for these systems. Un-permitted systems on developed lots will be required to demonstrate compliance with the LWDR that were in effect at the time the lot was developed, and pay the required permit fee.

For any lot less than ¾ acres, and in an area with a highly vulnerable body of water, a traditional septic system may be inappropriate and an advanced treatment system will likely be required pursuant to the Liquid Waste Regulations. The performance standard for advanced treatment is a reduction in total nitrogen to an average of 20mg/l or less. In addition, permit conditions imposed by NMED will include: a supplier's repair and replacement warranty for a minimum of two years, acceptable to the NMED; and quarterly monitoring requirements for an initial 2 year period of operation.

8.8.2.2 Alternative On-Site Treatment Systems

On-site treatment systems are technically feasible and can be installed on most properties, although they are typically used in areas of low housing density. These alternative treatment systems are less widely used in New Mexico, but interest in them is growing. They have some of the same limitations as standard on-site septic tank systems in that they may not be suitable

in areas with a high water table, poor soil, and/or shallow bedrock. However, many alternative treatment systems are capable of providing better treatment of the wastewater and can be installed in areas where septic tank systems are unable to provide adequate protection of groundwater. Again, additional treatment methods may be required for high-strength wastewater, typically generated by commercial or industrial facilities. Construction procedures for alternative systems are relatively standard, but because they can require pumps, electrical controls, float switches, alarms, and additional tanks, they are typically more difficult to install than standard systems, thus leading to increased construction costs. Disposal of effluent and solids for alternative on-site treatment systems is similar to that of septic tank systems. Other O&M requirements may be more extensive than standard on-site systems, and the homeowner is generally responsible for this work.

8.8.2.3 Decentralized Wastewater Treatment Systems

The term, “decentralized waste-water management,” refers to the process of treating and discharging treated wastewater in the local vicinity where it is generated. Decentralized systems typically use the soil as the final receptor of the treated wastewater instead of discharging to surface waters, which are generally the receptors of treated wastewater from larger centralized treatment plants. Wastewater is further treated in the soil; some is utilized by plants and, in many environments, much of it will recharge groundwater locally. Also, the soil is considered as part of the treatment process, not just the receptor of treated water.

A decentralized system employs a combination of onsite and/or cluster systems and is used to treat and dispose of wastewater from dwellings and businesses close to the source. Decentralized wastewater systems allow for flexibility in wastewater management, and different parts of the system may be combined into "treatment trains," or a series of processes to meet treatment goals, overcome site conditions, and to address environmental protection requirements. Small satellite treatment plants or soil absorption systems that have low-cost collection sewers are called cluster systems. Cluster systems treat wastewater from a group of dwellings and/or businesses and are most appropriate in moderately populated areas. These systems serve two or more dwellings (but not usually an entire community) and are located near the buildings they serve. The wastewater from each dwelling or business flows into its own interceptor (septic) tank to settle out and allow solids to break down. From the tank, the effluent is able to travel through smaller diameter, therefore less expensive, collection pipes. These pipes are buried at a shallower depth than full sewers and run relatively short distances to smaller, less maintenance-intensive treatment and disposal units. These units often use soil absorption fields or effluent recycling rather than discharging the treated wastewater into surface waters. Solids are typically disposed of between one and six times a year by a subcontractor at an approved facility. Composting or other beneficial uses may also be considered for the disposal of solids. In addition, decentralized systems may be able to reuse treated wastewater and/or, if subsurface disposal is used, qualify for return flow credits for water rights.

Decentralized (cluster) systems are less widely used, especially in New Mexico. Efficient operation requires a consistent, medium to large volume of wastewater flow with localized high housing density. The advanced treatment methods associated with decentralized systems are usually capable of treating high-strength wastewater generated by commercial or industrial facilities as well as domestic wastewater. Decentralized systems are technically feasible in all areas because they are not constrained by soil conditions and/or the water table elevation. Construction procedures for decentralized systems are relatively standard, but they can be more difficult for small contractors to build than standard systems. Therefore, high initial costs make decentralized systems more expensive than on-site treatment systems to install. Since

they are not on-site, the homeowner is relieved of O&M responsibility; conversely, ongoing O&M by a licensed operator is required.

A key element in the success of decentralized wastewater systems is good, regular management. The management requirements for a community or cluster decentralized system are low compared to centralized systems. Treatment facilities, particularly some of the more passive ones such as sand filters, may require the attention of a trained maintenance provider only once a month. Others may require attention more often but do not require the continuous presence of an operator. Available remote monitoring technology can minimize need for a site visit. The pipe networks associated with effluent collection systems are almost maintenance-free.

8.8.2.4 Centralized Wastewater Treatment Facility

Centralized systems require a network of collection pipes (sewers) leading from all homes and businesses to a central wastewater treatment facility. Conventional gravity sewer collection systems generally convey all of the wastewater to a single location for treatment and subsequent discharge to surface water. Centralized facilities are widely used and widely accepted. Efficient operation requires a consistently large volume of wastewater flow along with a widespread housing density. Centralized facilities are technically feasible in areas with poor soil, shallow bedrock, and/or a high water table. The advanced treatment methods associated with centralized systems are capable of treating high-strength wastewater generated by commercial and industrial facilities as well as domestic wastewater. The capital cost is relatively high and a large contractor is required for construction, but procedures are relatively standard. The homeowner is not directly responsible for routine O&M and a licensed operator(s) is required. As with decentralized systems, effluent from centralized systems may be disposed of below ground through gravel-filled leach field(s) or groundwater recharge well(s), or applied to the surface. Solids are typically disposed of monthly by a qualified subcontractor or facility operator. The solids can be taken to an approved facility, or they may be used for other beneficial purposes such as composting. Centralized facilities may also be able to reuse treated wastewater throughout a widespread area and/or qualify for return flow credits for water rights if subsurface disposal is used.

8.8.2.5 Wellhead Protection

A wellhead protection program (WHPP) is a planning and management approach to protect groundwater supply systems from contamination. By identifying and managing potential sources of contamination than can affect water supply wells, communities can do a better job of protecting public water supplies. The Wellhead Protection (WHPP) Program is a pollution prevention and management program used to protect underground based sources of drinking water. The national WHP Program was established in 1986 by the Safe Drinking Water Act. The law specified that certain program activities, such as delineation, contaminant source inventory, and source management, be incorporated into State Wellhead Protection Programs, which are approved by EPA prior to implementation. The purpose of a wellhead protection program is to restrict activities with the potential to cause contamination that could impact water supply wells. A wellhead protection program could be implemented in conjunction with septic tank regulations in areas where regulation of septic installations is needed because of proximity to water supply wells. The Safe Drinking Water Act defines a wellhead protection area as “the surface and subsurface area surrounding a water well or well field supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field.” The primary components of a wellhead protection program are:

1) Identify roles and duties of government and public water supply agencies;
2) Delineate the wellhead protection area (WHPA) for each wellhead;
3) Identify potential sources of contamination within each WHPA;
4) Develop management methods for wellhead protection, including education and regulatory approaches;
5) Develop contingency plans for public water supply systems;
6) Provide for proper siting of new wells to minimize potential contamination; and
7) Provide for public education and participation.

The New Mexico Wellhead Protection Program is a voluntary, five-step program designed to encourage community involvement in protecting local water supplies. These five steps are:

1) **Form a Community Planning Team**
   a) Initiate and implement the Wellhead Protection Program
   b) Evaluate community's existing and future watershed management needs
   c) Establish short & long term goals
   d) Inform the community about the Wellhead Protection planning efforts
   e) Develop land management strategies to insure protection of the water supply

2) **Define the land area to be protected**
   a) Conduct research to define the wellhead protection area. This may include watershed mapping, hydrogeologic investigation, contaminant transport research, and water system evaluation.
   b) Delineate the Wellhead Protection Area (WHPA) using computer models, a calculated fixed radius, or an arbitrary fixed 1000-foot radius.

3) **Identify actual and potential sources of contamination**
   a) Septic Tanks, Cesspools, Hazardous Waste Sites, Mining Activities, Industrial Areas, Leaking Underground Storage Tanks, Improperly abandoned wells, Oil Refineries, Landfills, Pesticides & Fertilizers, Household Waste, Animal and Human Waste.

4) **Manage the Wellhead Protection Area**
   a) Land Use Management
   b) Watershed Protection activities, Best Management Practices (BMPs), acquire land around the WHPA, Zoning Ordinances to limit land use, Conservation Easements
   c) Public Education
   d) Increase awareness and public participation, community meetings, road signs, brochures included with water bills, newspaper articles, school-based environmental education, Consumer Confidence Reports
5) **Plan for the Future**
   a) Develop a contingency plan for alternate water supplies
   b) Identify future problems and develop solutions
   c) Install backup water supplies in case of emergency
   d) Identify location of future wells
   e) Consider regional watershed planning
   f) Implement water conservation measures

The Source Water Protection area is the land around each supply well or surface water intake where spills, leaks, accidents or other forms of contamination may have a direct impact on the drinking water supply. The size of this area depends on soil type, site geology, groundwater flow rate, and on the drainage area and land use in the watershed. The susceptibility of drinking

water sources to contamination is based on the number and proximity of potential threats to the water supply and an evaluation of any sanitary defects at the wellhead, intake structures, or other components of the water system.

The New Mexico Environment Department Drinking Water Bureau (NMED-DWB) is conducting water utility reports under the Source Water Assessment and Protection Program (SWAPP) for all public water utilities. The SWAPP composite report integrates all elements of the Source Water Assessment Program and the Wellhead Protection Program. Final SWAPP reports are anticipated to help protect and preserve New Mexico's drinking water sources in the future by identifying potential sources of contamination (PSOC) and assisting water utilities with the development of protection plans. By December 2003, all public water utilities in New Mexico (1,300 utilities) will have completed SWAPP composite reports. It is anticipated that 50% of these utilities will formally adopt source water protection plans.

Potential sources of contamination are derived from industries, businesses and other activities which produce, use, distribute, or handle contaminants that have an established Maximum Contaminant Level (MCL) under The Safe Drinking Water Act. Generators of microbiological and pathogenic organisms are also included in the contaminant inventory.

Development of wellhead protection areas is technically feasible. To provide a technical basis for delineation of wellhead protection areas, the EPA has specified explicit criteria, including distance, drawdown, travel time, flow boundaries, and assimilative capacity.
An example of an analytical model is EPA's Wellhead Protection Area (WHPA) model (Blandford and Huyakorn, 1991), which is widely used to determine the configuration of time related capture zones for supply wells. In Quay County, a wellhead protection program is applicable to the communities of Tucumcari, Logan, San Jon, House, Forrest, and Nara Visa which rely on groundwater for their drinking water supplies.

8.8.2.6 Subdivision Ordinances

Subdivision ordinances relevant to protecting water quality in the region include items such as drainage and fire protection requirements. Additionally, as discussed in Section 8.10, subdivision ordinances may include requirements for ensuring availability of water. Development of drainage and fire protection requirements is technically feasible, and many good examples exist from other communities. Drainage specifications are directed at controlling runoff and erosion. Fire protection requirements include items such as allowing access for emergency vehicles as well as controlling the density of vegetation in close proximity to dwellings. Fire protection requirements indirectly affect water quality by preventing erosion and sedimentation that typically occurs after catastrophic forest fires.

8.8.3 Political Feasibility and Social/Cultural Impacts

NMED currently regulates septic tank and alternative on-site wastewater treatment systems. Decentralized and centralized wastewater treatment systems are regulated by both NMED and EPA. County-specific regulations, such as the Bernalillo County Wastewater Ordinance, adopted by Bernalillo County in 2000, may also govern these systems. Quay County may either elect to draft county-specific regulations governing wastewater disposal or to accept existing EPA and NMED guidelines. If the county chooses to draft its own regulations, it could use the Bernalillo County Wastewater Ordinance or other existing ordinances as a template. Prior to drafting county-specific regulations, county- or communitywide planning would be required, as well as determining areas in which these types of treatment facilities would be feasible.

Subdivision regulations could also be implemented on a countywide basis. Wellhead protection programs may be most easily implemented by groundwater-dependent communities.
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8.8.4 Financial Feasibility

The financial feasibility of implementing county water control ordinances varies among the options, as discussed below:

- *On-site septic tank systems:* The installation cost of a conventional on-site septic tank/leach field system is relatively low, approximately $2,400. The homeowner is typically solely responsible for both the cost of installation and routine O&M, and state and federal funding assistance is typically not available to owners of septic tank systems.
- *Alternative on-site treatment systems:* As with septic tank systems, the homeowner is solely responsible for both the cost of installation and O&M, and state and federal funding assistance is generally not available. These systems typically cost $3,500 to $7,500 more than conventional septic systems.
- *Decentralized (cluster) wastewater treatment systems:* Homeowners are typically responsible for both the cost of installation and ongoing O&M. Subdivision or area-wide covenants typically dictate responsibilities and fees, which can either be based on usage levels or flat rates. In contrast to individual on-site systems, however, state and federal funding is often available in the form of loans and/or grants to assist with construction of this type of treatment facility.
- *Centralized wastewater treatment facility:* Centralized systems are typically owned and maintained by a county or municipality, but installation costs and O&M are indirectly covered by homeowners serviced by the system. County, city, village, or community regulations typically dictate responsibilities and fees, which are usually based on usage levels or flat rates. State and federal funding is often available in the form of loans and/or grants to assist with construction of this type of treatment facility.
- *Wellhead protection and subdivision ordinances:* The cost of developing wellhead protection and subdivision ordinances should be fairly low. If wellhead protection modeling is conducted to assist with defining specific wellhead protection zones, the costs could range from approximately $30,000 to $150,000, depending on how many separate locations are evaluated. The greatest long-term cost for this alternative will be for ongoing monitoring and enforcement to ensure that ordinances are being adhered to. In addition, ongoing technical review and analysis will be required to determine if new developments meet criteria for ensuring availability of long-term water supplies. Also, technical review regarding adherence to drainage criteria will be needed. Some of this review may be completed by county employees, such as a drought task force coordinator or water resources staff, who also address other issues. Issues pertaining to fire protection could possibly be reviewed by the county fire marshal.

8.8.5 Hydrological Impacts

This alternative will not provide for any new water supplies or create any water savings; however, it will protect existing supplies from degradation and help to ensure that existing supplies are available to help meet future demands. Without water quality protections, existing water resources may not be suitable to meet future demand.

8.8.6 Environmental Impacts

This alternative would create positive environmental impacts by protecting groundwater supplies from septic tanks or other contaminant sources. Drainage and fire protection ordinances could help to reduce erosion and sedimentation in the county, prevent severe sedimentation of downstream reservoirs, and prevent loss of forest habitat.
Wastewater ordinances could have the following environmental impacts:

- *On-site septic tank systems:* In areas with relatively low housing density, on-site septic tank systems generally provide adequate wastewater treatment. However, groundwater or surface water can be impacted by these systems, especially in areas of high housing density or in cases where the system is not maintained properly. Additionally, on-site systems are not suitable for sites with certain conditions such as a high water table, shallow bedrock, steep slopes, poorly draining soil, or proximity to surface water or drainages.
- *Alternative on-site treatment systems:* Alternative on-site treatment systems generally provide additional treatment of wastewater beyond what a standard septic system offers. Though they tend to be more protective, the potential for groundwater or surface water impact is still present, especially in areas of high housing density or in cases where the system is not maintained properly. However, they are typically better suited for areas that are not conducive for on-site septic tank systems.
- *Decentralized (cluster) wastewater treatment systems:* Decentralized systems generally provide better treatment of wastewater than standard or alternative septic systems, resulting in increased protection of groundwater. Primarily due to advanced treatment methods, increased monitoring and O&M requirements, and the use of licensed operators, the potential for groundwater or surface water impacts to occur is lower, even in areas of high housing density.
- *Centralized wastewater treatment facility:* Centralized facilities typically provide the highest level of wastewater treatment, resulting in the best protection of groundwater. The potential for groundwater or surface water impacts to occur is lower due to advanced treatment methods, increased monitoring and O&M requirements, and the involvement of a licensed operator.

8.8.7 Recommendations and Implementation

The City of Tucumcari is currently contracted with the engineering firm, Souder-Miller, to evaluate and design an upgrade to their centralized wastewater treatment system. The city will continue to operate and maintain the centralized system.

The Village of Logan is currently evaluating the extension of sewer service to the western limits of the Village. The system being considered are a conventional gravity flow system with lift stations, a Grinder Pump/Low collection system which requires a small pumping facility at each building connected to the sewer service, or a Vacuum Sewer System which requires a vacuum structure constructed at each sewer service. The option receiving most consideration is the Grinder Pump/Low Gravity System since a gravity flow system may not be appropriate due to elevation requirements and stated objections by the ISC to Pump stations adjacent to Ute Lake. A manufacturer of the vacuum system has indicated that the area being considered is not a good candidate for the Vacuum Pump System. The effluent would be transmitted to an enlarged lagoon system capable of handling the seasonal flows. The ENMRWA has approved a measure to include the Logan Sewer Project as a component of the ENMRWS for water

quality preservation of Ute Reservoir. The ENMRWA will include the sewer project in its request for Federal and State funding of the ENMRWS.

The Village of San Jon is served by a gravity flow system that uses treatment lagoons to treat the waste water. The Village system is capable of handling up to 38,400 gallons of waste water per day. The Village is not considering at this time any modification to its sewer system and treatment lagoons. The Village of San Jon has a Discharge Permit DP-535 for treated water in excess of the evaporation lagoons capacity to be disposed of by land application over a maximum of 24.5 acres of rangeland. In the future with planned growth the Village will need to expand it's service area and consider an upgrade to its sewage treatment plant.

The Village of House should consider the implementation of a sewer system to eliminate the chance that septic tanks with leach fields may contaminate the Village's water supply. The Village has a well head protection plan; a copy is included in Appendix D.

8.9 Recycle Municipal Wastewater

Wastewater reclamation and reuse is being practiced successfully in several locations in the western United States as a means of increasing or supplementing the available supply of water and preserving potable water for drinking water uses. Accordingly, the Quay steering committee has indicated the desire to consider reuse of treated wastewater for non-potable uses such as agricultural and recreational uses.

The degree of treatment and the standards to be met depend upon the end use of the reclaimed water. Wastewater reuse is an environmentally and socially responsible way to increase local water supplies.

8.9.1 Technical Feasibility

The primary technical challenge in reusing wastewater is treatment of the water to bring it to an acceptable level of quality. Treatment of wastewater for reuse has been practiced at some locations within the U.S. for more than 25 years.

NMED has recently issued (August 2003) a policy for the above ground use of reclaimed domestic wastewater.. This policy requires a permit for discharge of the reuse water. This permit, which describes the reuse application (use, flows, etc.) and specifies a water quality monitoring program, must be filed with NMED for each reuse site. NMED policy does not allow for reuse of wastewater for potable applications. In 1992, the EPA published guidelines for water reuse, defining a broad range of reuse applications and presenting guidelines for treatment water quality and implementation.

Table 8-15. Classes for Reclaimed Wastewater

Class of Reclaimed Wastewater	Approved Uses
Class 1A	All Class 1 uses. *No setback limit* to dwelling unit or occupied establishment.
	Backfill around potable water pipes
	Irrigation of food crops[1]
Class 1B	Impoundments (recreational or ornamental)
	Irrigation of parks, school yards, golf courses[2]
	Irrigation of urban landscaping[2]
	Snow making
	Street cleaning
	Toilet flushing
	Backfill around non-potable piping
Class 2	Concrete mixing
	Dust control
	Irrigation of fodder, fiber, and seed crops for milk-producing animals
	Irrigation of roadway median landscapes
	Irrigation of sod farms
	Livestock watering
	Soil compaction
Class 3	Irrigation of fodder, fiber, and seed crops for non-milk-producing animals
	Irrigation of forest trees (silviculture)

[1] Irrigation of food crops shall only be allowed for food crops when there is no contact between the edible portion of the crop and the wastewater. Spray irrigation is prohibited for food crops.

[2] If reclaimed wastewater is applied using spray irrigation, the setback limitation of Table 8-17 “Spray Irrigation” is required.

Table 8-16. Reuse Treatment Standards

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Standards		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 1A	BOD[5]	10 mg/l	15 mg/l	6-hour composite[5]	3 tests per week for major WWTP[1] 1 test per 2 weeks for minor WWTP
	Turbidity	3 NTU	5 NTU	Continuous	Continuous
	Fecal Coliform[2]	5 per 100 ml[3]	23 per 100 ml[4]	Grab sample at peak flow	3 tests per week for major WWTP 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow
Class 1B	BOD5	30 mg/l	45 mg/l	6-hour composite[5]	3 tests per week for major WWTP[1] 1 test per 2 weeks for minor WWTP
	TSS	30 mg/l	45 mg/l	6-hour composite	3 tests per week for major WWTP[1] 1 test per 2 weeks for minor WWTP
	Fecal Coliform[2]	100 organisms per 100 ml[3]	200 organisms per 100 ml[4]	Grab sample at peak flow	3 tests per week for major WWTP 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow
Class 2	BOD[5]	30 mg/l	45 mg/l	6-hour composite for major WWTP[5] Grab sample for minor WWTP	1 test per week for major WWTP 1 test per month for minor WWTP
	TSS	30 mg/l	45 mg/l	6-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP 1 test per month for minor WWTP
	Fecal Coliform[2]	200 organisms per 100 ml[3]	400 organisms per 100 ml[4]	Grab sample at peak flow	3 tests per week for major WWTP 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Standards		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 3	BOD5	30mg/l	45 mg/l	3-hour composite for major WWTP[5] ; Grab sample for minor WWTP	1 test per week for major WWTP 1 test per month for minor WWTP
	TSS	75 mg/l	90 mg/l	3-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP 1 test per month for minor WWTP
	Fecal Coliform2	1,000 organisms per 100 ml[3]	5,000 organisms per 100 ml[4]	Grab sample at peak hourly flow	1 test per week for major WWTP 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow

[1] The composite samples must be taken on separate days.

[2] The E. coli organism may alternately be tested once equivalent concentrations are determined.

[3] Measured as the monthly geometric mean.

[4] Single sample maximum value.

[5] 24-hour composite sampling may used in lieu of 3 or 6-hour composite sampling requirements.

Table 8-17 provides the minimum standards for access controls and setback distances necessary to minimize direct and indirect public exposure to reclaimed wastewater. Setback distances required in the policy are in all cases the distance from the edge of any area receiving reclaimed wastewater to well casings, dwelling unit, or occupied establishment.
In addition to the setback requirements described in Table 3, all water supply wells within 200 feet of a wetted irrigation area must be evaluated for adequate well head construction and irrigation practices to ensure protection of ground water. NMED may impose setback requirements as needed to make certain that the application of reclaimed wastewater does not threaten ground water resources.

Table 8-17. Set Back Requirements

Class	Spray Irrigation	Flood Irrigation and Surface Drip Irrigation
Class 1A	• No access control • No setback to dwelling unit or occupied establishment	• No access control
Class 1B	• No access control; irrigate at times when public exposure is unlikely • 100 ft set-back from dwelling unit or occupied establishment	• No access control; irrigate at times when public exposure is unlikely
Class 2	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate or other NMED approved access controls • 100 ft set-back from dwelling unit or occupied establishment	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate, or other NMED approved access controls
Class 3	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate • 500 ft set-back from dwelling unit or occupied establishment • Low pressure/low trajectory irrigation system only	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate • 100 ft set-back to dwelling unit or occupied establishment.

The responsibility of meeting the standards set forth in the NMED policy is assigned to the generator of the reclaimed wastewater unless the responsibility is assumed by a separate entity pursuant to an approved Ground Water Discharge Permit. Implementation of the standards for existing dischargers will be determined on a individual facility basis at the time of permit renewal and/or modification.

The discharge of reclaimed wastewater may also be regulated by the United States Environmental Protection Agency (EPA) or the New Mexico Construction Industries Division (CID). Discharges to waters of the United States (including ephemeral streams and dry arroyos) require a National Pollutant Discharge Elimination System permit from EPA. The use of reclaimed wastewater for indoor plumbing (e.g., toilet flushing, fire suppression) requires approval from CID.

Current regulations generally require secondary treatment of wastewater in order to meet NMED discharge standards. The degree of wastewater treatment necessary beyond secondary treatment (and thus the cost of the treatment) will depend on the quality standards required for the use of the water. A higher-quality effluent can be provided by applying tertiary treatment with additional treatment processes. The effectiveness of tertiary processes for treating wastewater to a high quality is well documented.

8.9.1.1 Inject Treated Wastewater as Artificial Recharge

In Quay County, groundwater is the primary water source for municipal and domestic use. Due to this reliance on groundwater, the steering committee might also consider the future use of treated wastewater to recharge the aquifers in the groundwater use areas.

Treated effluent may be recharged to groundwater by pumping it into the ground through injection wells or by percolation from surface recharge basins. Artificial recharge of groundwater is regulated under the OSE Underground Storage and Recovery Regulations (19.25.8 NMAC, effective January 31, 2001). The OSE determines whether the recharged water is fully recoverable using recovery wells or whether an unrecoverable loss occurs. The Act has a delayed implementation clause which may prevent the State Engineer from effectively implementing the program. Section 17 of the Act states: "A governmental entity shall not submit an application pursuant to the Ground Water Storage and Recovery Act and the state engineer shall not process an application, issue a regulation pursuant to that act or implement any part of that act unless the state engineer has been appropriated enough money or has sufficient resources to carry out the provisions of that act."

Groundwater is widely used as a drinking water source in Quay County and New Mexico. Injection or percolation of treated wastewater into the ground is considered indirect potable reuse, and the State of New Mexico has not enacted guidelines or regulations regarding acceptable quality for effluent recharge for indirect potable reuse. NMED requirements would typically be expected for recharge effluent quality, depth to groundwater, and minimum setback distance from existing drinking water wells. Any discharge of effluent to an aquifer, however, will require a groundwater discharge permit to ensure that groundwater standards are not violated.

At this time, the injection of treated water for aquifer recharge does not appear to be a viable option to pursue. In the future as the regulations are drafted and implemented the communities of Quay County may choose to evaluate this option more carefully.

8.9.1.2 Current Reuse in Quay

One WWTP in Quay County serves a significant permanent population. This is the city Of Tucumcari Plant. The City of Tucumcari treats and releases an average of 2 acre-feet per day which is discharged into the Pajarito Creek under a discharge permit. The potential annual reuse would equal approximately 730 acre-feet which is approximately 45% of the average annual water production by the city. The City is currently working on a project to upgrade the WWTP. The city has contracted with Scanlon and Associates to analyze and design the upgrade to the plant. The city is including potential to reuse waste-water into the upgrade of the plant. The current City of Tucumcari NPDES permit Table 8-18 provides for treatment that will meet the requirements of Class 1B for all parameters Except for Fecal Coliform Bacteria. The Fecal Coliform Bacteria Requirements if minimally met would classify the effluent as Class 3 waste water. The city would need to treat the effluent to reduce the Fecal Coliform Bacteria from a permitted level of 500 organisms per 100 ml to a 30 day average of no more than100 organisms per 100 ml to meet Class 1B requirements. Table 8-19 lists the recent test results for the effluent from the Tucumcari Waste Water Treatment Facility. The effluent would meet the requirements of Class 1B waste water for reuse.

Table 8-18. REQUIREMENTS FOR TUCUMCARI NPDES PERMIT

REQUIREMENTS FOR TUCUMCARI NPDES PERMIT						
PARAMETERS	DISCHARGE LIMITATIONS/REPORTING REQUIREMENTS				MONITORING REQUIREMENTS	
	QUANTITY/LOADING		QUALITY/CONCENTRATION		SAMPLE	
	(LBS/DAY UNLESS STATED)		(mg/L UNLESS STATED)		ANALYSIS	TYPE
	MONTHLY AVG	DAILY MAX	MONTHLY AVG	DAILY MAX		
Flow	****	****			Daily	Totalizing Meter
BOD_5	230	N/A	30	45	1/ week	6-Hr Composite
TSS	230	N/A	30	45	1/ week	6-Hr Composite
Fecal Coliform Bacteria Colonies / 100 ml	N/A	N/A	500	500	1/ week	Grab
Total Residue Chlorine (TRC)	N/A	N/A	N/A	No Measurable[1]	1/ day	Grab
	QUALITY (UNITS AS STATED)					
	MINIMUM	MAXIMUM				
pH (Standard Units)	6.0	9.0				
Footnotes:						
[1] After dechlorination and prior to final disposal, the effluent shall contain NO MEASURABLE total residual chlorine (TRC) at any time. NO MEASURABLE will be defined as no detectable concentration of TRC as determined by any approved method established in 40 CFR 136.						

Table 8-19. Tucumcari Effluent Test Results

TUCUMCARI EFFLUENT TEST RESULTS					
	BOD JAN-FEB 2004	TSS JAN-FEB 2004	Fecal Coliform Bacteria* 3/2003-2/2004	TRC JAN-FEB 2004	pH JAN-FEB 2004
Average	18.9	11.6	16.5	0.0	
High	27	14.6	35.3	0.1	7.24
Low	18.5	9	4.0	0	7.09
*geometric mean					

The Villages of Logan and San Jon use sewage treatment lagoons. The Village of Logan currently The Village of Logan has contracted with the Larkin Group to analyze the benefits of expanding their sewer system to include the portion of the community currently relying on individual septic tank and drain fields. The Village of Logan is interested in protecting Ute Reservoir form sewage contamination. The draft report to The Village Of Logan by the Larkin Group, Nov. 2003, discusses reuse of the effluent and recommends treating the waste water to Class 1A Standards. The Village of House does not have a sewer system in place and relies on individual septic systems.

None of the communities currently reuse their treated effluent. Golf courses may use up to or exceeding 1 million gallons of water a day, and the Tucumcari WWTP is sophisticated enough to produce an effluent of sufficient quality for use on the golf course. The Village of Logan with the high recreation visitation may develop a golf course and the siting of the course could be such to take advantage of their effluent for landscape irrigation. Potentially all the treatment plants could also reuse their treated effluent for landscape irrigation. Depending on the distances and terrain involved, the cost of delivering the water to the point of use is the biggest hurdle to overcome in reusing the effluent .

8.9.1.3 Required Maintenance

Any reuse option requires that high quality effluent is produced to assure public health and safety, and when human health is at risk, effluent must be constantly monitored and safeguards must be built in. To monitor and safeguard the system, the proper infrastructure must be in place and maintained.

Any WWTP producing effluent for reuse must disinfect the water using some type of treatment process and equipment. Whatever the disinfection methods, the equipment must be constantly monitored and regularly maintained to ensure proper operation and effective disinfection. The majority of the WWTPs in Quay County are lagoon systems, which are capable of producing water of sufficient quality for reuse with the addition of filtration and disinfection. Careful and frequent monitoring, especially during season changes, is essential. Managers and operators of a WWTP producing water for reuse must be aware of the health risks that improper operation can cause. Operation and maintenance plans must be implemented and rigorously followed. Emergency action plans must also be in place so that in the event of failure low-quality water will not enter the reuse system. If the system fails and water is produced that does not meet the requirements, safeguards must be in place at the facility to divert, store, or reprocess the low-quality water. This would require the building of storage ponds to which low-quality water can be diverted for retreatment or storage.

8.9.1.4 Implementation Strategy

The following actions are recommended to examine the feasibility of implementing reuse of treated wastewater as a strategy for conserving potable water supplies in Quay County:

- The community and consultant firms hired by the communities work with the NMED and NMDH to identify the reuse options available within current regulations.
- Evaluate the suitability of the current standards and assess the impact that would occur if these standards were to become more stringent in the future.
- Identify potential reuse options and sites (agriculture, industrial, lawn watering, etc.) that are reasonably close to current and future wastewater discharge points.
- Identify needed treatment processes for anticipated end uses.
- Once the potential for reuse has been assessed, evaluate and develop financing mechanisms for reuse options and projects.
- Approach decision making regarding reuse with an effective public involvement process to build public support for reuse within the County.

8.9.2 Political Feasibility and Social/Cultural Impacts

The primary social concern regarding wastewater reuse is the potential for human contact with wastewater (e.g., when parks where children play are irrigated with wastewater). If treatment is not adequate, or temporarily fails, there is a genuine concern about human health impacts.

8.9.3 Financial Feasibility

Costs for wastewater reuse alternatives will depend on the standards to be met, the volume treated, the end use, the distance treated effluent must be pumped and/or piped, and the cost of permitting. Costs of effluent reuse fall into several categories:

- Construction/modification and operation of treatment facilities needed to meet standards for planned end uses
- Construction and operation of storage facilities needed to ensure a reliable supply on a day-to-day basis, accounting for seasonal differences in supply of effluent and use
- Construction and operation of the transmission and distribution system
- Costs of resolving claims due to diminished return flows for downstream users who have relied upon effluent discharges
- End-user adaptation costs, which can include:
  - On-site hookup and replumbing to connect to the non-potable system
  - Special equipment, such as corrosion-resistant devices
  - Additional on-site treatment for water-quality-sensitive end uses
  - Idling of other water supply facilities (e.g., groundwater wells) that will no longer be used
- Worker safety and public health practices, as applicable
- Higher maintenance costs (cleaning, reducing clogging) relative to those for other water sources
- More frequent leaching and higher volume of leaching water to control salt buildup in irrigation uses

As suggested by the above list, costs would include both operating and infrastructure costs. Both types of costs are affected by the size of the facility, with smaller reuse facilities typically having a higher unit cost due to the smaller volume of effluent.

Costs for treatment and reuse of wastewater effluent differ substantially from one area to another across the U.S. The cost of reuse in Quay County will differ from one community to another because of local conditions, and a separate assessment of the cost feasibility for each community will need to be made. The assessment of reuse options is beginning in the City of Tucumcari and village of Logan. Reuse options away from municipalities typically are limited due to a lack of locally generated wastewater and the high cost of conveying wastewater.

The ENMRWA has approved a measure to include the Tucumcari Waste Water Reuse project as a component of the ENMRWS for water quality preservation of Ute Reservoir. The ENMRWA will include the effluent reuse project in its request for Federal and State funding of the ENMRWS.

8.9.3.1 Funding Sources

Funds for planning, design, and implementation of wastewater reuse are available from two primary sources: federal programs and local funding (Section 8.12). Several federal programs exist that can provide grants or loans. The principal federal funding mechanisms include:

Title XVI, Reclamation, Recycling and Water Conservation, through the U.S. Bureau of Reclamation (USBR). Eligible projects include reclamation and reuse of municipal and other wastewaters and naturally impaired waters. The maximum federal cost share is 50 percent for planning and 25 percent each for design and construction. The maximum federal share amount for construction is $20 million for a single project, regardless of total cost. In

most cases, the federal share is non-reimbursable, resulting in a de facto grant to the local project sponsors. Projects are funded by congressional appropriations.

Water Supply Act projects, through the U.S. Army Corps of Engineers. In the past, Congress has authorized the Corps to assist specific local communities with municipal water supply and treatment needs not necessarily associated with other Corps projects. These special projects are funded individually through congressional appropriations.

Environmental Programs and Management, through the U.S. EPA. Eligible projects are environmental infrastructure. Maximum federal cost share varies, with the maximum funding for a single project approximately $4 million.

State Assistance Grants, through the U.S. EPA. Eligible projects are environmental programs and infrastructure projects for water, drinking water, and wastewater.

Clean Water Act State Revolving Loan Fund, through the U.S. EPA/States. Eligible projects are wastewater treatment.

Safe Drinking Water Act State Revolving Loan Fund, through the U.S. EPA/States. Eligible projects include drinking water facilities to provide a safe supply and quality improvement.

USBR Loan Program. Eligible projects include conservation, water quality improvement, enhancement of fish and wildlife, and support of Native American self-sufficiency.

Rural Utilities Services (RUS) funding, through the Department of Agriculture. Grants and loans for communities of 10,000 or less are available for up to 75 percent of the development cost of a project, which helps reduce user costs to a reasonable level.

Additional funding might include:

- *Treated effluent sales.* Contract users of treated effluent can be charged for the quantities of effluent used. Selling treated effluent, rather than providing it at no charge, is standard practice in most communities in the southwestern U.S. Examples of treated effluent rate structures are listed in Table 7-8. In general, rates charged for treated effluent are below the costs of treating and conveying it and must be subsidized to encourage its acceptability and use by consumers. For agricultural reuse, sale of treated effluent may not be possible during the fallow season.
- *Government partnerships/private funding sources.* Entities interested in using reclaimed water could be approached to help fund the costs associated with treatment and reuse.

It is likely that a funding package using several mechanisms including the ENMRWS will be needed to implement effluent reuse within Quay County.

8.9.4 Hydrological Impacts

Since municipal water (and wastewater) represents a small proportion of the total water used in Quay County, reuse will not have a large impact on the overall water situation in the county. However, it could improve efficiency in individual municipalities and would have a significant impact on the participating community.

8.9.5 Environmental Impacts

The key environmental issue related to wastewater reuse is discharging the treated wastewater to the environment. If treatment standards are sufficient, there should be no adverse environmental impact from this alternative. However, if treatment is insufficient, environmental issues could arise from this practice. One environmental and public health concern regarding wastewater reuse is the potential for adverse effects on aquatic organisms and/or humans due to contact with chemicals that typical wastewater plants do not provide treatment for (e.g.,

endocrine disrupters, hormones, and antibiotics). Additional research regarding the impacts of these constituents is required.

8.9.6 Recommendations and Implementation

The City of Tucumcari is implementing improvements to the Wastewater treatment facility that would include the installation of a treated effluent pump station and a wastewater reuse line from the water reclamation facility to the sports fields and the municipal golf course. The reuse line would carry reclaimed water to be used for irrigation of these facilities and help mitigate concerns of future water shortages and drought conditions. The approximate location of the facilities and the proposed line location are shown on the enclosed figures in the Appendix. By utilizing the wastewater effluent from the facility, the City of Tucumcari would have approximately 226 million gallons or 694 acre-feet of reuse water available for irrigation purposes on an annual basis. For this intended use, the City of Tucumcari would have to meet the requirements for Class 1B Waste Water.

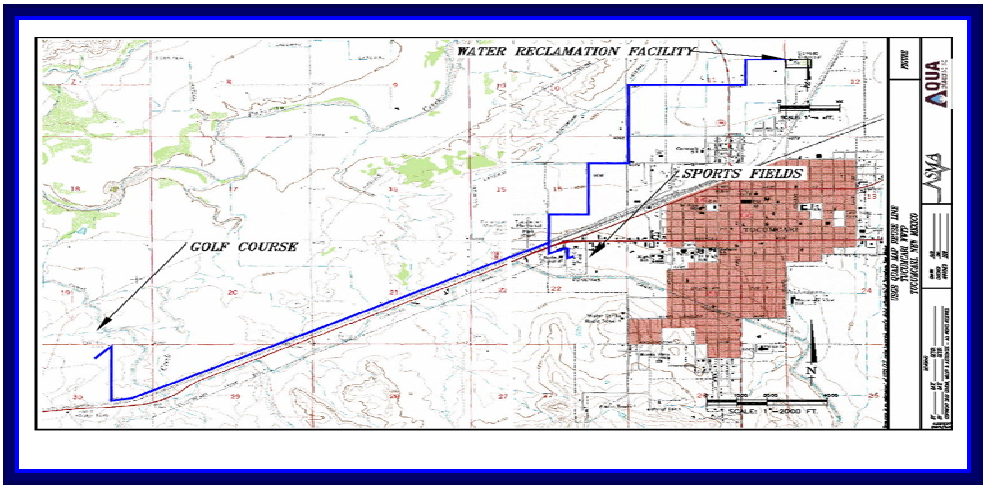
Table 8-20. Tucumcari Reuse Estimate

Item	Quantity	Unit Cost	Cost
Transmission Line (12" PVC C900 including fittings, restraints and appurtenances)	7.5 Miles	$63,360	$475,200
Booster Station (including three 30 HP pumps, building, HVAC, electrical and other appurtenances)	LS	$125,000	$125,000
1-1/2" Combination Vacuum / Air Relief Valves	8	$600	$4,800
12" Gate Valves (spaced every half mile)	15	$2,500	$50,000
Misc. Mechanical / Piping	LS	$20,000	$20,000
Altitude Valve	1	$10,000	$10,000
100,000 Gallon Storage Tank	1	$75,000	$75,000
Contingency (10%)			$76,000
CONSTRUCTION TOTAL			$836,000
Design (8%)			$66,800
Construction Inspection (6%)			$50,160
PROFESSIONAL SERVICES TOTAL			$116,960
TOTAL PROJECT COST			$952,960
Note: NMGRT not included in estimated project costs			

In general, the flow requirements through the transmission line from the waste water treatment facility to the Golf Course and the Sports Fields would be similar to that observed during average flow conditions at the facility. The average flow conditions are 0.62 MGD or 430 gpm. The elevation of the Water Reclamation Facility is 4,050 feet above mean sea level while the golf course is approximately 4130 feet above mean sea level. For a velocity of 2.5 feet per second, a 12" diameter PVC pipe would be used as the transmission line over the approximately 7.5 mile length noted on the figures in the Appendix. The pressure loss through this transmission line is 43 feet of head (19 psi). Using a safety factor of 1.5, the required flow

rate for the reuse line would be 645 gpm with an estimated total dynamic head of 123 feet (54 psi). A 30 HP pump should be sufficient to meet these conditions. The design of the reuse system would include the following components listed in Table 8-20 along with the estimated construction and professional services cost.

Figure 8-4. Tucumcari Reuse Pipeline Schematic



8.10 Municipal Water Supply Infrastructure and Management

The communities of Tucumcari, Logan, San Jon, House, Forrest and Nara Visa will over the life of the plan need to upgrade and replace water and sewer infrastructure. The existing infrastructure ranges from relatively new systems at House and Logan to a system with portions past their design life expectancies at Tucumcari.

8.10.1 City of Tucumcari

The City of Tucumcari Water distribution system is composed of various materials (PVC, AC, Copper and Cast Iron). The city storage system consists of seven storage tanks with the capacity to store approximately 5,000,000 gallons of water. The city's storage tanks are shown in Table 8-21.

Table 8-21. City of Tucumcari Water Storage

Storage Tank	Storage *(gal)*	Tank Type	Installation Date
Hoover	165,000	(Concrete)	?
Metro	220,000	(Steel)	1938
Center St.	1,000,000	(Steel)	1959
11th St.	2,000,000	(Steel)	1967
11th St.	589,000	(Concrete)	?
La Joya	1,000,000	(Steel)	1964
Westridge	110,000	(Steel)	1987
Totals	5,084,000		

The city has begun to upgrade its distribution system with the identification and replacement of older lines. The city needs to continue to replace the older infrastructure on a systematic basis. The replacements to date were planned based on repairs made and the need to coordinate with street renovation projects. The city has a general map of its distribution system but the mapping is incomplete as to exact location and type of line, age, location of all valves and age, and location of all service lines with associated meters. The city needs to update its mapping and use the GIS/GPS computer based systems currently owned by the City. The mapping system is available but accurate base data is not available nor being gathered systematically. The City needs to prioritize the gathering of basic information during every service call made such as, location of line, service line, meter, valve, location of break and type of repair and the development of a comprehensive relational database for use with the GIS Software. The city needs to establish a policy to install isolation valves during emergency repairs to facilitate shutoffs in the future; many of the repairs made currently are under “hot “ conditions with water service on due to the inability to shut down the line. The city also needs to identify where additional isolation valves are necessary and budget for the emplacement of the valves at the rate of five to ten per year. This would allow the city to develop a grid distribution system where small areas may be shut down while maintaining service to the majority of the system to facilitate repairs. The grid system would also facilitate systems upgrades grid by grid.

The central storage tank at Center St handles all of the water pumped and delivered to the City. All of the water flows through this tank and its pumps which are of 1920’s vintage. The addition of the new tank and replacement of the pump station has been funded through a $500,000 CDBG grant which was awarded in March 2004. This replacement will be a continuing step in the necessary replacement of the City’s infrastructure. The concrete tanks of unknown age need to be scheduled for replacement as soon as possible. The Storage capacity is adequate for now and the future except that additional storage may be necessary if the aggressive growth pattern emerges as planned by the city.

Over the past three fiscal years the efficiency of the water delivery system has ranged from 94% to 78% efficient. Generally a water system should have an efficiency of greater than 90% which indicates that the city needs to implement water management measures. The unaccounted for water may be related to:

- Errors
  - Meter inaccuracy
  - Human (meter reading, accounting inaccuracies)

- Loss
  - Theft (unmetered users)
  - Leaks
  - Reservoir overflow
- Authorized, unmetered uses
  - Firefighting
  - Street cleaning
  - Water main flushing
  - Construction water
  - Parks

Table 8-22. Tucumcari Water Delivery Efficiency

Tucumcari Water Delivery Efficiency			
	Produced	Water Sales	Efficiency (%)
2001	537,556,000	504,012,245	93.8
2002	573,002,000	446,012,901	77.8
2003	377,495,000	315,241,680	83.5

The recommended steps are to perform a system audit which involves identifying all sources of system inefficiency, water loss, revenue loss, and initiate plans to reduce waste and improve system efficiency, after a series of tests and calculations, designed to balance the water supplied to a system, with the water legitimately used. The audit should include;

- Review of distribution system and maps
- Collecting source and service meter records for the review period
- Water produced and calculating how much water entered and left the system during the review period
- Meter water sales
- Estimated and unmetered water uses
- Testing meters for accuracy
- Estimating the volume and cost of unaccounted-for water
- Review of existing monitoring procedures
- Estimated system losses
- Review of existing pertinent projects in execution
- Analyzing the data and developing an action plan

The benefits to the city of performing a water audit will include;

- Water loss reduction and consequent cost reduction (electrical energy, chemical products, etc.)
- Increased income with the detection of consumers that are not being billed or are being billed incorrectly
- Improved knowledge of the operating system
- Optimization of supply sources thus postponing investment in new units
- Improved public relationship
- Reduction of risks to private properties
- Reduction in illegal connections

The City is initiating a program to replace meters within the city with touch-read meters. This program will improve efficiency by replacing the older possibly inaccurate meters and should improve meter reading accuracy and the overall accounting of water sales. The city should also inventory and develop a plan to replace water hydrants for fire protection.

8.10.2 Village of Logan

The water distribution system is comprised of PVC lines that radiate from the main trunk line. The system is in good condition and the Village is able to maintain the system aggressively. The Village has recently purchased the irrigation well and associated declared water rights from Mr. and Mrs. O.O. Osborn. This well and declared water rights are listed in Tables 4-1 and 6-3. The efficiency of the Village delivery System based on 2003 data is 96.55% which reflects a newer system with all water produced and delivered metered.

Over the life of the plan the system will need continual maintenance and replacement of deficient sections. The Village budgets for personnel, equipment, supplies for line maintenance as well as tank maintenance and meter installations within their annual budget. The village should pursue GIS/GPS mapping of the village with layers for water and sewer systems included to provide a management tool for managing the water and sewer infrastructure.

The water storage tanks are listed in Table 8-23 which shows storage capacity of over 700 gallons per user (recommended). The growth patterns for Logan show that additional storage may be needed based on the growth scenarios Table 8-24.

Table 8-23. Village of Logan Water Storage

Village of Logan Water Storage			
Tanks	Capacity	Age	Elev.
Harding County	167950	1976	3915
Smith Well	145041	1976	3925
Goggins Well	290000	2000	3865
Total	602991		

Table 8-24. Village of Logan Future Water Storage Requirements

Village of Logan Water Storage Requirements								
	2000	2005	2010	2015	2020	2025	2030	2040
Users (Slow Growth)	822	830	839	847	855	864	873	881
Storage Requirements	575,400	581,154	586,966	592,835	598,764	604,751	610,799	616,907
Users (Medium Growth)	822	863	906	952	999	1,049	1,102	1,157
Storage Requirements	575,400	604,170	634,379	666,097	699,402	734,372	771,091	809,646
Users (Fast Growth)	822	904	995	1,094	1,203	1,324	1,456	1,602
Storage Requirements	575,400	632,940	696,234	765,857	842,443	926,687	1,019,356	1,121,292

The Village of Logan is experiencing growth just outside its municipal boundaries with subdivisions being developed along the South shore of Ute Lake. It is reasonable that the Village will annex the subdivision(s) in the future and will need to upgrade its water distribution sewer systems to service the subdivision(s). A new storage tank holding 50,000 gallons is being installed to serve the new subdivision.

8.10.3 Village of San Jon

The Village water system is comprised of nine wells, a treatment unit with reverse osmosis and liquid chlorinating systems, four storage tanks (Table 8-25), two booster pumps and distribution system. The Storage capacity is adequate for now and the future including an aggressive growth scenario. The village is currently constructing a trunk line to tie into the Village of Logan Water System with an additional booster station which will improve the quality of the village water delivered to users. The distribution system is composed of a mix of PVC, Ductile Iron, Galvanized Steel, and Asbestos Concrete distribution lines and 40% HDPE/60% Copper service lines. Thirty percent (30%) of the distribution lines and sixty percent (60%) of the service lines have been in place for over 25 years. The village will continue upgrading the distribution and service lines initially concentrating on the AC lines.

Table 8-25. Village of San Jon Water Storage

Village of San Jon Water Storage		
Tanks	**Capacity**	**Age**
Village Tank-Elevated	**100,000**	**1976**
5 miles N. on NM469	**250,000**	**1993**
Booster Pumps Tank	**75,000**	**1956**
Logan Tank	**250,000**	**2002**
Total	**675,000**	

The village needs to install meters to measure all water produced or purchased as well as all service connections including Village connections. The village did not replace meters at production wells recently due to the Logan connection project and the efficiency of the system at this time is indeterminate. The Village needs to perform a Water System Audit to assure that the system is efficient and to determine losses. The Village intends to pursue GIS mapping of the village in 2007 and layers for water and sewer system need to be include to provide a management tool for managing the water and sewer infrastructure.

The Village plans to rebuild the Wastewater treatment plant in 2008. The village also will maintain the village tanks aggressively to assure cleanliness, operability and to prevent corrosion. Tank cleaning and repainting for is scheduled for 2005 (2 tanks) and 2008 (1tank) and approximately every three years dependant on condition and need.

8.10.4 Village of House

The Village of House has the newest water system of the incorporated communities with operations beginning in October of 1988. The village is served by one (1) municipal well and a 75,000 gallon storage tank. Over the life of the plan the Village will be upgrading its distribution and service lines as dependant on conditions, growth patterns, and funding. The original town well is still in existence although the Village has not as yet declared water rights associated with the well. The Village intends to pursue refurbishing the well to act as a backup to the main well. The storage tank is adequate for the Village now and the foreseeable future. The Village may add an Additional Storage Tank to serve as a backup when repairs to the existing tank are needed. Additional Storage of 50,000 to 75,000 gallons will be adequate.

The Village is considering the development of a sewer system to replace the existing septic tanks which serve Village residents. The Village will be considering all options including centralized and decentralized treatment facilities.

8.10.5 Quay County

Generally, the county population is served by domestic wells and septic systems which will continue to be the source of water for the future. The County is served by five water cooperatives, three near Tucumcari who purchase water from the City, and Forrest and Nara Visa Community Systems. All of the cooperatives will need to provide upgrades to their systems within the life of this plan. Quay County Government assists the cooperatives with funding applications and support for the projects. Forrest needs to replace their 25,000 gallon storage tank which was well used prior to acquisition by the cooperative. RAD and Hills Village needs to expand services to county residents whose domestic wells are quantitatively/qualitatively sufficient to meet the residents' needs. In general the cooperatives distribution and service lines are in general need of upgrading.

The county has allocated a portion of its Ute Lake reservation to the Ute Lake South Shore Subdivision (Logan, 8.10.2). The County will need to coordinate with the developers and the Village of Logan to determine if the subdivision infrastructure will be annexed by the Village, remain private or become a County run system. The county will at least need to install meters and establish a maintenance and meter reading program to assure that costs billed to the County by ENMRWS are billed to the Subdivision appropriately.

8.11 Water/Sewer Rates

Municipalities face dilemma when establishing fees for municipal owned and operated facilities (water, sewer, etc.). Municipal officials want to keep user rates low. However, insufficient user rates, combined with a reluctance to adjust rates upward when necessary, contribute to a progressive operating deficit, ultimately requiring substantial rate increases.

8.11.1 Establishing Appropriate Rates

There are many factors which should be weighed when considering water/sewer rates such as operational costs, debt service, capital improvements and reserves to meet emergency needs. Administrative expenses attributed to the water or sewer systems (prorated portions of administrative salaries, legal expenses, insurance premiums, pension contributions, costs of audits, and other expenses partially attributed to the enterprise) may also be charged to the fund.

Rating structures generally fit into four basic categories: Flat Charge, Uniform Rate, Declining Block Rate or Ascending Block Rate.

- The Flat Charge Rate is used when the municipality has no metered customers. Each user is billed the same amount, regardless of usage. Administration of this rate is simple, since it does not consider usage volume in the billing process.
- The Uniform Rate bills all water at the same unit rate, regardless of the amount used. This rate encourages water conservation, but can hamper industrial growth. This obstacle, however, may be overcome by establishing a separate uniform rate for industrial users, a logical step since it costs less to produce additional volumes of water once fixed costs are allocated.

- The Declining Block Rate is preferred by large volume water users, since it provides for a progressive decrease in the unit cost of water as the aggregate volume used increases. Although widely used, this rate does not encourage water conservation.
- In contrast, the Ascending Block Rate promotes water conservation by providing for a progressive increase in the unit cost of water as the aggregate volume used increases. However, the actual cost of production may not be reflected in the rates, making a separate industrial rate structure desirable.

Regardless of the rate structure chosen, a minimum rate can be established for all customers. This minimum rate should be based upon the fixed costs of the operation attributed to debt service, pensions, unemployment insurance, workers' compensation, audits, Medicare contributions, liability insurance, utilities, Laboratory costs, chemicals, and some salaries. Municipalities may also consider charging higher rates to customers located outside the corporate limits.

8.11.2 Rate Management

Municipalities should constantly monitor their water rate structure to ensure that water revenues are sufficient to meet costs. At the same time, water and sewer facilities should be operated in a businesslike manner, cutting waste where possible, to be self-sufficient while providing the commodity to the consumer at the lowest possible cost.

A good practice is to evaluate rates annually and never less than once each two years. This practice will not only help a municipality avoid unpopular large rate increases, but will also provide for a more responsible operation by providing sufficient revenue to maintain and manage the facility. For effective pricing, utilities, communities, and water planners will need to consider at least three issues: the service population's ability to afford higher rates, the effects of conservation rates on a utility's revenues, and their actual effectiveness in reducing water demand (Stallworth, U.S. Environmental Protection Agency).

8.11.3 Assessment Tools and Information Sources (Stallworth, U.S. Environmental Protection Agency).

- **Show-Me Ratemaker**

  The state of Missouri's Department of Natural Resources offers free software that can be downloaded from its Web site at; **www.dnr.state.mo.us/oac/lgov.htm.** Show-Me Ratemaker can be run on Microsoft Excel, providing users with 5-year financial projections
- **IWR-MAIN Water Demand Analysis Software**

  Developed under sponsorship of the U.S. Army Corps of Engineers, the Institute for Water Resources, Municipal and Industrial Needs for Water Resources (IWR-MAIN) software has been updated and continually modified since its inception in 1982. The most recent versions can be used on a personal computer. More about this software can be found at; ***www.iwrmain.com/.***

8.11.4 Existing Rates within Quay County

The existing water and sewer rates are shown in Table 8-26 for each of the communities within Quay County. The City of Tucumcari and the Village of House have a flat rate structure with a minimum fee for the first 3000 gallons used per month. The Villages of Logan and House have ascending block rate structures with a minimum fee for the first 4000 and 3000 gallons used respectively. The Villages of Logan, San Jon and House rates are adequate today to cover

operational costs and administrative costs for their water and sewer systems. The City of Tucumcari is in the process of reviewing their rates structure to determine its adequacy to provide adequate revenue to cover operational and administrative costs. The City needs to perform system audits in conjunction or prior to the rate analysis to assure that the systems are efficient and that the costs incurred and rate structure adopted are necessary to provide the users with the expected level of service at the most economical cost.

Table 8-26. Existing Rates within Quay County

Tucumcari Water Rates							
	Inside City Limits		Outside City Limits				
	Res.	Comm.	Res.	Comm.	RAD	Hills Village	Liberty
0-3000 min.	$11.60	$14.00	$16.50	$18.50	$1.69	$1.69	$1.47
3001 +	$2.21	$2.21	$3.32	$3.32	$1.69	$1.69	$1.47
Logan Water Rates							
	Meter Size						
0	3/4"	1"	2"	4"	6"		
0-4000 min.	$14.25	$19.25	$26.25	$55.25	$100.00		
4000-10000	$1.25	$1.25	$1.25	$1.25	$1.25		
10001-20000	$1.35	$1.35	$1.35	$1.35	$1.35		
20001-50000	$1.50	$1.50	$1.50	$1.50	$1.50		
50000 +	$2.00	$2.00	$2.00	$2.00	$2.00		
San Jon Water Rates		House Water Rates					
Gallons Delivered	Rates	Gallons Delivered	Rates				
		0-3000 min.	$16.50				
0-2999 min.	$11.00	3000+	$1.20				
3000-12999	$2.00						
13000-22999	$2.25						
23000-99999	$2.75						
100000 +	$3.25						
Tucumcari Sewer Rates		San Jon Sewer Rates		Logan Sewer Rates			
		Residential	$12.00	Residential	$7.00		
0-3000 min.	$4.64	Commercial	$14.00 +$2.25/gal	Commercial			
3001 +	$1.69	Septic Tank Dumping Rate	25.00 +$3.00/gal	Up to 5000 gallons	$7.00		
				5001-25000 gallons	$0.50		
				25001+	$0.25		

The communities have not adopted Water Conservation Ordinance and water conservation rate pricing although the ascending rate structures of Logan and San Jon may be considered conservation pricing. As the communities adopt water conservation ordinances adjustment of water and sewer rates may be necessary.

In addition, based on the individual community's involvement and wholesale cost of water from the ENMRWS; the communities within Quay County will need to address the rate pricing of the water delivered from Ute Reservoir through the system. The estimate wholesale cost of the water for the various alternatives including the original conceptual design with peer review pricing and the no-participation pricing are shown in Section 8.2

8.12 Desalination

Salt water (Brine) if treated can be used for Municipal or Industrial purposes.

8.12.1 Introduction

The world's supply of fresh water is limited and increasingly overburdened and degraded. The United Nations estimates that 5 to 10 million people die each year from lack of water or from diseases related to polluted water. The U.S. is not exempt from shortages--municipal needs compete with industrial, agricultural, environmental, rural, and other uses. Public health, economic, infrastructure, and environmental problems will multiply as the gap between water supply and demand grows. Meeting our water needs as demands grow becomes increasingly urgent and more difficult (National Desalination Clearinghouse).

Desalination purifies water from unconventional sources (e.g., seawater, inland impaired and brackish water, and wastewater). By purifying these currently unused water sources, desalination can (National Desalination Clearinghouse):

- Improve water quality. Desalination purifies water qualities beyond the U.S. Environment Protection Agency's safe drinking water quality regulations, thus ensuring public health and protecting our environment.
- Provide water where people live. Over 70 percent of the U.S. population currently lives near an ocean or other impure source water that could be desalinated and used. As the population continues to move to coastal areas, ocean desalination becomes an increasingly useful option to provide water.
- Help manage water. Desalination has tremendous potential as a water management tool to meet demands and provide a reliable "drought proof" water supply by tapping previously unused water sources and advancing wastewater reuse and recycling.

8.12.2 Desalination in Quay County

The Lake Meredith Salinity Control Project is capable of producing 250 gpm of salt water (Brine) that if treated can be used for Municipal or Industrial purposes. This would eliminate the injection of the saltwater and result in a source of water. The Villages of Logan and San Jon submitted an application for Financial Assistance from Governor Richardson's water Innovation fund. The application was for the treatment of non potable brine water by using Reverse Osmosis (RO) in conjunction with pre-treatment (slow sand filtration and nano filtration, a patented process). The intent is to provide potable water to the Villages and some rural residents of Quay County. The reject streams would be routed to solar drying beds for evaporation and harvesting of the deposited minerals. The application as submitted is included in Appendix G in its entirety.

8.13 Public Education and Outreach Program

A public education and outreach program can play a key role in achieving the goals and objectives identified in the alternatives described in this regional water plan. Public education and outreach efforts can help support:

- Participate in ENMRWS
- Municipal water conservation
- Agricultural water conservation
- Water quality protection
- Land and water use policies
- Drought planning

Many of the topics to be covered are closely related, however, public outreach programs typically focus on one topic at a time since the audience and activities associated with each may be different. Public education and outreach activities should be constant and consistent to ensure long-term conservation and water quality protection.

8.13.1 Public Education and Outreach Program Implementation

Table 8-26 presents a framework for developing public education and outreach campaigns.

8.13.2 Public Education and Outreach Program Costs

Public education and outreach program costs will vary depending on who does the work, the type of materials produced, and the type or amount of media time and/or space needed. In Quay County the media consists of an AM/FM Radio Station, KTNM/KQAY, and a biweekly newspaper, the Quay County Sun. TV air time may be available from either the Albuquerque or Amarillo networks or the Public Broadcast Channel in Portales. Public education efforts associated with water conservation efforts may cost less per acre-foot of demand reduction than purchasing additional water rights to increase supply.

Public outreach and education can be implemented on a part-time basis through a county-wide water coordinator position. Grants may be available for funding this position and associated activities. Material costs can be minimized by drawing on existing materials produced by the OSE, the AWWA, and other sources, or by getting permission to use and print materials developed by other municipalities. Other materials such as how-to manuals and informational brochures can be purchased for a similar cost and simple posters can be produced inexpensively.

Table 8-27. Implementing a Public Education and Outreach Program

Step No.	Description of Activities	Application
Step 1: Establish a target audience	Determine the customer classes or categories with the greatest impact on this issue.	Analyze pertinent information to assess, sort, and target customer classes. Establish a baseline to assess the potential success of the program, to monitor the program after it has been implemented, and to provide data to guide future planning.
Step 2: Assess outreach methods and messages	Examine current public messages and activities to assess what information is missing and identify the communication methods that would most effectively reach the target customers (e.g. newspapers, posters, bill stuffers, or radio public service announcements).	Campaigns can be run by a single entity or on a county-wide basis by a public education coordinator. A meaningful campaign clearly communicates the program message: Possible outreach methods include: ❖ Brochures sent with water bills ❖ Public service announcements on radio and television ❖ Conservation recommendations integrated with weather reports ❖ Media releases, posters and "how-to" manuals ❖ Public meetings ❖ School outreach (educate parents by involving children)
Step 3: Establish resources needed, develop support, and Implement	Determine available staff and financial resources. Public outreach may range from low cost (posters, bill stuffers, media releases) to higher cost (media messages, public forums, newspaper inserts, billboards, brochures, handbooks, speakers bureaus). Work with network of professionals and active volunteers.	Major costs of a public outreach and education program are associated with designing, printing, and distributing materials. To contain costs: ✦ Produce materials internally ✦ Ask members of water-oriented committees to help spread the word" by publishing information in their newsletters

8.14 Funding for Continued Planning and Implementation

Funding is needed to successfully implement the alternatives discussed in this 40 year water plan. Potential sources of funding for the alternatives listed are identified in Table 8-13. This table also provides links to web sites that can be used by the QWG to obtain additional information about the funding sources and application requirements.

Table 8-28. State and Federal Funding Sources

State and Federal Funding Sources	
Program Title	***Agency* / Web Site or Contact**
Catalog of Federal Domestic Assistance	**http://www.cfda.gov/**
United States Army Corps of Engineers	***U.S. Army Corps of Engineers*** ***Albuquerque District Office*** **Albuquerque: 505-342-3109** **http://www.spa.usace.army.mil** ● **Federal Drought Programs** ● **Construction of wells or transport of water drought-distressed areas.** ● **Assists in planning for the development, utilization, and conservation of water and related land resources and ecosystems.** ● **Emergency Well Construction and Water Transport**
Department of Housing and Urban Development	**Community Block Development Grants** **HUD in New Mexico** **625 Silver Avenue, SW Suite 100** **Albuquerque, NM 87102-3185** **Phone: (505) 346-6463** **Fax: (505) 346-6604** ● **CPD Program and Initiative Index** **http://www.hud.gov/offices/cpd/about/cpd_programs.cfm**
Department of Finance and Administration / Local Government Division	**Community Block Development Grants** **Community Development Bureau** **505- 827-4950** **http://www.state.nm.us/clients/dfa/Files/LGD/CDB/index.html**
EPA	● **Environmental Finance Program** **http://www.epa.gov/efinpage/** ● **EPA Grants and Fellowship Information** **http://www.epa.gov/epahome/grants.htm** ● **State-EPA NPS Partnership** **http://www.epa.gov/owow/nps/partnership.html**

State and Federal Funding Sources	
Program Title	***Agency* / Web Site or Contact**
New Mexico Environment Department,	***Construction Programs Bureau*** **Santa Fe: 505-827-2806** **http://www.nmenv.state.nm.us/cpb/cpbtop.html** **http://www.nmenv.state.nm.us** ● **New Mexico Clean Water State Revolving Fund (CWSRF)** ● **Rural Infrastructure Revolving Loan Program (RIP)** ● **New Mexico Solid Waste Facility Grant Fund Program (SWFGFP)** ● **New Mexico Special Appropriations Program (SAP)**
USDA	● **Community Facilities (CF) Direct Loans and Grants** **http://www.rurdev.usda.gov/rhs/cf/cp_dir_grant.htm** ● ***Rural Utility Services (RUS)*** ***Albuquerque: 505-761-4955*** **Water and Waste Loans and Grants Emergency Community Water Assistance Grants** **http://www.rurdev.usda.gov/nm/index.html** **http://www.usda.gov/rus/water/programs.htm** **#EME RGENCY http://www.usda.gov/rus/water/programs** ● **Small Watershed Program** **http://www.nrcs.usda.gov/programs/watershed/** ● **Environmental Quality Incentives Program** **http://www.nrcs.usda.gov/programs/eqip/** ● **Conservation Technical Assistance** **Albuquerque Office: 761-4407; 1-800-410-2067** **http://www.nrcs.usda.gov/programs/cta/** ● **Conservation Reserve Program** ***USDA Natural Resources Conservation Service*** **http://www.nrcs.usda.gov/programs/crp/** ● **Emergency Conservation Program** ***Albuquerque : 505-761-4407; 1-800-410-2067*** **http://www.fsa.usda.gov/pas/disaster/ecp.htm** ● **Emergency Watershed Protection** ***USDA Natural Resources Conservation Service*** **http://www.nrcs.usda.gov/programs/ewp/ewp.html** ● **Water Quality Program** **http://www.reeusda.gov/nre/water/water.htm**
U.S. Bureau of Reclamation	**Albuquerque Area Office: 505-248-5323** ● **Reclamation States Emergency Drought Relief Act of 1991 - Title II http://www.uc.usbr.gov/progact/waterconsv/wtr_wmp.html http://nris.state.mt.us/drought2001/reports/DRTBuRecDrRelief.html** ● **Reclamation Wastewater and Groundwater Study Program** **http://www.cfda.gov/static/p15504.htm** ● **Water Reclamation and Reuse Program** **http://www.usbr.gov/tcg/guidelines/**

State and Federal Funding Sources	
Program Title	***Agency* / Web Site or Contact**
NM Finance Authority	**NMFA: (505) 984-1454 toll free, 1-877-ask-nmfa Finance Authority Emergency Funding and Water and Wastewater Grant Program**
New Mexico Emergency Management Center	**Public Assistance /Emergency Measures Program Santa Fe: 505-476-9600 http://www.dps.nm.org/emergency/em_index.htm http://www.fema.gov/reg-vi**
U.S. Geological Survey	**GUIDE FOR THE SUBMISSION OF UNSOLICITED PROPOSALS http://www.usgs.gov/contracts/grants/unsolbk.html**
National Park Service	**Land and Water Conservation Fund Grants to States http://www.ncrc.nps.gov/PROGRAMS/LWCF/index .html**

In addition to the funding opportunities shown on Table 8-13, local funding mechanisms such as the following can be used:

- *Bonds.* Bonding capacity is a function of the amount and type of revenue available, bond rates, and other factors.
- *Expansion/impact fees.* Expansion fees, also known as tap fees, are typically paid to a municipality by those responsible for the development of new areas or construction of new dwelling units.
- *Water/wastewater rates.* Rate increases could be used to provide needed funds for water projects.

References

Ballance, W.C. 1968. Arkansas River basin – Geography, geology, and hydrology. p. 13-23

Canadian River Municipal Water Authority – Lake Meredith Salinity Control Project, http://www.crmwa.com/lmscp2.htm

Blandford, T. N. and P. S. Huyakorn. 1991. *U.S. EPA WHPA - A modular semi-analytical model for the delineation of wellhead protection areas, version 2.0.* American Institute of Hydrology. March 1991.

Blaney, H.F. and E.G. Hanson. 1965. *Consumptive use and water requirements in New Mexico.* Technical Report 32, New Mexico State Engineer Office. 85 pp.

Hayes, M.J. 1999. *Drought indices.* http://enso.unl.edu/ndmc/enigma/indices.htm. Updated October 12, 1999.

National Climatic Data Center (NCDC). 2002. *NCDC: CLIMVIS Information.* http://lwf.ncdc.noaa.gov/oa/climate/onlineprod/drought/overview.html

New Mexico. Ground-Water Report 1, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.

New Mexico Department of Agriculture (NMDA). 1962-1998. *New Mexico Agricultural Statistics.*

New Mexico Economic Development Department (New Mexico EDD). 2002. *New Mexico County Statistics*

New Mexico Environment Department (NMED). 2003, 2004 *See NMED SWQB 2003 below.*

NMED. 2003a. *Past and current leak sites by city*. <http://www.nmenv.state.nm.us/> Underground Storage Tank Bureau, reports and lists.

NMED. 2003b. *See NMED SWQB 2000-2002 below.*

NMED. 2003c. *Major New Mexico municipal and industrial NPDES permittees.* <http://www.nmenv.state.nm.us/> Surface Water Quality Bureau, Point Source Regulation.

NMED SWQB. *State of New Mexico 303(d) list for assessed streams and river reaches.* <http://www.nmenv.state.nm.us/swqb/2003_New_Mexico_303d_ List.pdf> TMDL Development.

New Mexico Interstate Stream Commission (ISC). 1994. Regional water planning handbook.

New Mexico State Engineer Office (comp.), *Water resources of New Mexico - Occurrence, development and use.*

New Mexico Office of the State Engineer (NM OSE). 2001. *Water information*. <www.seo.state.nm.us/water-info/index.html>. March 12, 2001.

NM OSE. 2002. *Water information*. <http://seowaters.ose.state.nm.us/awdProd>. Accessed

New Mexico Water Quality Control Commission (NMWQCC). 2000. *Water quality and water pollution control in New Mexico 2000: A report for submission to the Congress of the United States by the State of New Mexico pursuant to Section 305(b) of the Federal Clean Water Act*. NMED/SWQ-00/1.

Palmer, W.C. 1965. *Meteorological drought.* Research Paper No. 45, U.S. Department of Commerce Weather Bureau, Washington, D.C.

Sorensen, E.F. 1981. *Water use by categories in New Mexico counties and river basins, and irrigated acreage in 1980*. Technical Report 44, New Mexico State Engineer Office, Santa Fe, New Mexico.

Stallworth, Holly Ph.D. Conservation Pricing of Water and Wastewater 4/10/00

Stallworth, Holly Ph.D. Water and Wastewater Pricing, Office of Wastewater Management, U.S. Environmental Protection Agency, EPA 832-F-03-027

United States Bureau of Reclamation (USBOR), ACHIEVING EFFICIENT WATER MANAGEMENT, A Guidebook for Preparing Agricultural Water Conservation Plans, December 1996, Updated September 2000

United States Department of Agriculture (USDA). 1999. *1997 Census of agriculture: New Mexico state and county data, Volume 1, Geographic Area Series, Part 31.*

United States Environmental Protection Agency (U.S. EPA). 1988. *Guidelines for delineation of wellhead protection areas*. EPA 440/6-87-010.

United States Geological Survey (USGS). 2001 *New Mexico NWIS-W data retrieval.* <http://waterdata.usgs.gov/nwis-w/NM/>.

USGS. 2003, 2004. *Daily stream flow for the Nation.* <http://waterdata.usgs.gov/nwis/discharge>

Wilson, B. 1986. *Water use in New Mexico in 1985*. Technical Report 46, New Mexico State Engineer Office.

Wilson, B.C. 1992. *Water use by categories in New Mexico counties and river basins, and irrigated acreage in 1990*. Technical Report 47, New Mexico State Engineer Office.
Wilson, B.C., and A.A. Lucero. 1998. *Water use by categories in New Mexico counties and river basins, and irrigated acreage in 1995*. Technical Report 49, New Mexico State Engineer Office.

Wilson, B.C., and A.A. Lucero. 2003. *Water use by categories in New Mexico counties and river basins, and irrigated acreage in 2000*. Technical Report 51, New Mexico State Engineer Office.

Appendix A - Bibliography

Author	Report Date	Title	Publishing Information
Ballance, W.C.	1967	Arkansas River basin – Geography, geology, and hydrology.	Office of the State Engineer (comp.), Water resources of New Mexico: Occurrence, development and use. State Planning Office, Santa Fe, New Mexico.
Consensus Planning	Feb 2004	City of Tucumcari Comprehensive Plan	City of Tucumcari
Daniel B. Stephens & Associates, Inc	March 2003	Colfax County Regional Water Plan	Colfax Soil and Water Conservation District Raton, New Mexico
Eastern Plains Council of Governments	Oct. 1989	NE Regional Water Plan	Eastern Plains Council of Governments Clovis, NM
Engineer's Inc.	Feb. 1998	Logan Infrastructure Plan	Village of Logan PO Box 7 Logan, NM 88426
El Llano Estacado RC & D	Nov 1985	Water Issues Statement for NE NM	Eastern Plains Council of Governments Clovis, NM
Harris, Linda G. updated by Leslie Blair	1984 & 1992	New Mexico Water Rights	WRRI Miscellaneous Report Number 15 NM Water Resource Research Institute New Mexico State University
Jarnis Environmental Consultants	Dec. 2003	ENMRWS Conceptual Design Peer Review	http://www.enmrwa.com/default.htm Eastern New Mexico Regional Water Authority
Gordon Herkenhoff and Associates, Inc.	July 1967	Tucumcari, NM Water Resources Study and Development Program	City of Tucumcari
Leedshill-Herkenhoff, Inc.	Sep. 1983	Water Investigation Report For City of Tucumcari	City of Tucumcari
Leedshill-Herkenhoff, Inc.	Jul. 1984	Water Investigation Report For City of Tucumcari "Proposed Water Wells"	City of Tucumcari
Marron and Associates	March 1997	Environmental Assessment for US 54 Railroad Crossing	New Mexico State Highway and Transportation Department

Author	Report Date	Title	Publishing Information
New Mexico Environment Department		Water Supply Regulations	http://www.nmenv.state.nm.us/dwb/dwbtop.html Drinking Water Bureau
New Mexico Environment Department		Drinking Water Regulations	http://www.nmenv.state.nm.us/dwb/dwbtop.html Drinking Water Bureau
New Mexico Environment Department.	2001	Past and current leak sites by city.	<http://www.nmenv.state.nm.us/> Underground Storage Tank Bureau, reports and lists. 2004
New Mexico Environment Department	2001	Major New Mexico municipal and industrial NPDES Permittees.	<http://www.nmenv.state.nm.us/> Surface Water Quality Bureau, Point Source Regulation. March 12, 2001.
New Mexico Environment Department	2001	2000-2002 State of New Mexico 303(d) list for assessed streams and river reaches.	<http://www.nmenv.state.nm.us/> Surface Water Quality Bureau, TMDL Development. March 9, 2001.
New Mexico Interstate Stream Commission	Dec. 1994	Regional Water Planning Handbook	http://www.seo.state.nm.us/index.html
New Mexico Office of the State Engineer (NM OSE).	March 2001	A Water Conservation Guide for Public Utilities	http://www.seo.state.nm.us/water-info/conservation/h2o-products.html 1-800-WATER-NM
New Mexico Office of the State Engineer (NM OSE).	2001	Water information.	www.seo.state.nm.us/water-info/index.html>.
New Mexico State Engineer Office	1967	Water Resources of New Mexico: Occurrence, development and use	State Planning Office, Santa Fe, New Mexico
New Mexico Water Quality Control Commission (NMWQCC).	2000	Water quality and water pollution control in New Mexico 2000: A report for submission to the Congress of the United States by the State of New Mexico pursuant to Section 305(b) of the Federal Clean Water Act.	NMED/SWQ-00/1.

Author	Report Date	Title	Publishing Information
Ortiz, D., K. Lange, and L/ Beal	1998	Water Resources Data, New Mexico, Water Year 1998, Vol. 2, The Arkansas River Basin, the San Juan River Basin, the Gila River Basin, and Ground-Water Wells	USGS Water-Data Report NM-98-2
Smith Engineering Co.	Sept. 2003	Final Conceptual Design Report on ENMRWS	http://www.enmrwa.com/default.htm Eastern New Mexico Regional Water Authority
Smith Engineering Co.	Nov. 1999	Data Collection Summary Report for ENMRWS	http://www.enmrwa.com/default.htm Eastern New Mexico Regional Water Authority
Smith Engineering Co.	Jan. 2002	Project Update Report on ENMRWS	http://www.enmrwa.com/default.htm Eastern New Mexico Regional Water Authority
Souder, Miller and Associates	March 2004	Preliminary Engineering Report on Tucumcari Waste Water Treatment Upgrades	City of Tucumcari
Sorensen, E.F.	1976	Water use by categories in New Mexico counties and river basins, and irrigated and dry cropland acreage in 1975	Technical Report 41, New Mexico State Engineer Office
Sorensen, E.F.	1981	Water use by categories in New Mexico counties and river basins, and irrigated acreage	Technical Report 44, New Mexico State Engineer Office, Santa Fe, New Mexico
Sun, R.J.	1986	Regional Aquifer-System Analysis Program of the U.S. Geological Survey Summary of Projects, 1978-84	U.S. Geological Survey Circular 1002
Trauger, F.D. and F.X. Bushman	1964	Geology and Groundwater in the Vicinity of Tucumcari, Quay County, New Mexico	Technical Report 30, New Mexico State Engineer Office, Santa Fe, New Mexico
URS Corporation	Dec. 2003	ENMRWS Conceptual Design Peer Review	New Mexico Interstate Stream Commission, Santa Fe, New Mexico
US Bureau of Reclamation	Dec. 1976	New Mexico Water Resources Assessment for Planning Purposes	
Wilson Brian C.	March 1998	Regional Water Plan Memorandum to File	Memorandum, New Mexico State Engineer Office, Santa Fe, New Mexico

Author	Report Date	Title	Publishing Information
Wilson Brian C.	Nov. 1986	Water Use in New Mexico in 1985	Technical Report 46, New Mexico State Engineer Office, Santa Fe, New Mexico
Wilson Brian C.	Jul. 1992	Water use by Categories in New Mexico Counties and River Basins, and Irrigated Acreage in 1990	Technical Report 47, New Mexico State Engineer Office, Santa Fe, New Mexico
Wilson Brian C. and A.A. Lucero	Sep. 1997	Water use by Categories in New Mexico Counties and River Basins, and Irrigated Acreage in 1995	Technical Report 49, New Mexico State Engineer Office, Santa Fe, New Mexico
Wilson Brian C. and A.A. Lucero	Sep. 1998	Water use by Categories in New Mexico Counties and River Basins, and Irrigated Acreage in 2000	Technical Report 51, New Mexico State Engineer Office, Santa Fe, New Mexico
Wilson Brian C. and A.A. Lucero	Feb. 2003	Irrigated Agriculture Water use and Acreage in New Mexico Counties and River Basins, 1993-1995	Technical Report 50, New Mexico State Engineer Office, Santa Fe, New Mexico

Appendix B - Public Involvement Information

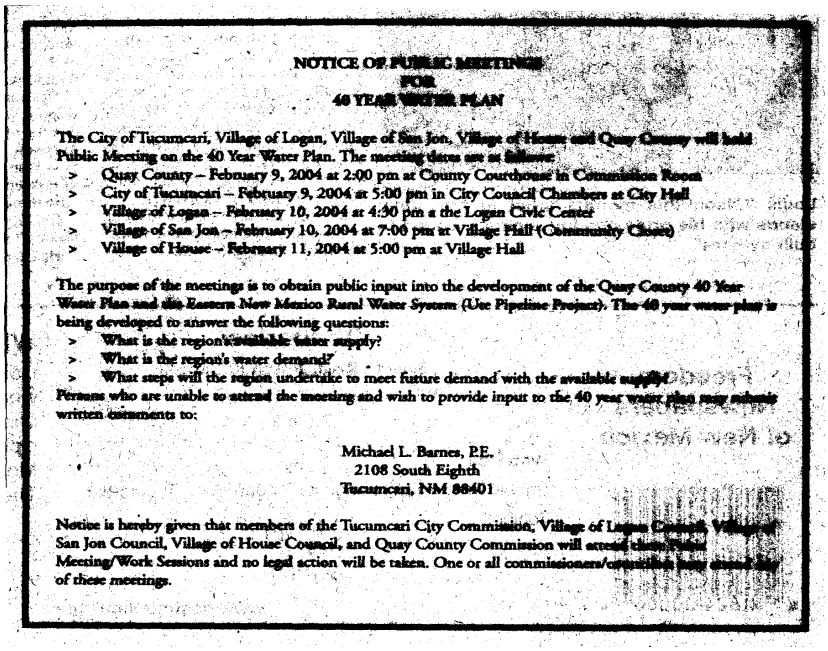
Quay Working Group

City of Tucumcari
Village of Logan
Village of San Jon
Village of House
Quay County

Steering Committee

City of Tucumcari	Richard Primrose
Village of Logan	Larry Wallin
Village of San Jon	Bobbye Rose
Village of House	Linda Lavender
Quay County	Paula Chacon/Terry Turner

Scanned Advertisement of Public Meetings from Quay County Sun



NOTICE OF PUBLIC MEETINGS
FOR
40 YEAR WATER PLAN

The City of Tucumcari, Village of Logan, Village of San Jon, Village of House and Quay County will hold Public Meeting on the 40 Year Water Plan. The meeting dates are as follows:

> Quay County – February 9, 2004 at 2:00 pm at County Courthouse in Commission Room
> City of Tucumcari – February 9, 2004 at 5:00 pm in City Council Chambers at City Hall
> Village of Logan – February 10, 2004 at 4:30 pm a the Logan Civic Center
> Village of San Jon – February 10, 2004 at 7:00 pm at Village Hall (Community Closet)
> Village of House – February 11, 2004 at 5:00 pm at Village Hall

The purpose of the meetings is to obtain public input into the development of the Quay County 40 Year Water Plan and the Eastern New Mexico Rural Water System (Ute Pipeline Project). The 40 year water plan is being developed to answer the following questions:

> What is the region's available water supply?
> What is the region's water demand?
> What steps will the region undertake to meet future demand with the available supply?

Persons who are unable to attend the meeting and wish to provide input to the 40 year water plan may submit written comments to:

Michael L. Barnes, P.E.
2108 South Eighth
Tucumcari, NM 88401

Notice is hereby given that members of the Tucumcari City Commission, Village of Logan Council, Village of San Jon Council, Village of House Council, and Quay County Commission will attend these Public Meeting/Work Sessions and no legal action will be taken. One or all commissioners/councilors may attend any of these meetings.

Public Meeting Presentation

Slide 1

Quay County 40 Year Water Plan

Quay Working Group

Michael L. Barnes, P.E.

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REGIONAL WATER PLANNING IN NM

- Initiated in 1987
- Overall purpose of regional water planning in New Mexico is to protect our water resources
- 16 Planning Regions in New Mexico
- Quay County is part of Eastern Plains Planning District 1
- 40 Year Water Plan will be incorporated into Regional Water Plan

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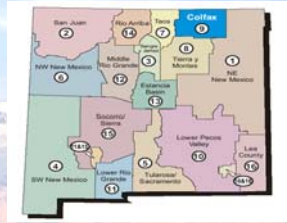
Location of NE NM Planning Region No. 1



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Quay County 40 Year Water Plan

- A water plan answers the following questions
  - **How much water is available?**
  - **How much water will be needed?**
  - **What alternatives can be implemented so that demand can be met!**

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Quay Working Group

- City of Tucumcari
- Village of Logan
- Village of San Jon
- Village of House
- Quay County

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Quay County 40 Year Water Plan

- ***Public Participation***
  - Public meetings
  - Communication with the public
  - Documentation of public participation
- **Today we want to hear input on alternatives for meeting future water supply needs!**

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Quay County 40 Year Water Plan

- **Public input will be incorporated into alternatives analysis.**
- **Draft plan will be prepared this Spring (will be available for public review).**
- **Draft plan will be finalized by steering committee (representatives from City of Tucumcari; Villages of Logan, San Jon and House; and Quay County).**

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Quay County 40 Year Water Plan

- **Final plan will be presented to ISC and OSE for Review.**
- **County and municipalities will implement the plan.**

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Quay County 40 Year Plan Vision

- Healthy environment
- Healthy and growing regional economy
- Quality recreation
- Natural resource conservation
- Adequate water availability
- Respect for private property rights
- Healthy and thriving communities

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Goals for Quay County 40 Year Water Plan

- Cooperation
- Protection of water rights
- Planned growth
- Conservation and recycling
- Provide accurate data
- Manage resources while preserving public health
- Educate the public

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Surface Water Summary

- The last 20 years have been a period of above normal water yield. Last two years have been below normal.
- Future conditions could be below normal yield, at least in some years.
- Planning for reduced supply to meet demand in drought years.

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Groundwater Resources

- Entrada Sandstone
- Ogallala Aquifer
- Localized alluvial deposits
- Localized limestone aquifers

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Water Rights

- Water rights are for a defined quantity.
- Water rights have a priority date; the earliest priority dates receive preference in times of drought.

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Water Demand in Quay County

- Water supply is approximately 95% surface water and 5% groundwater
- Most of the water is used for irrigated agriculture
- The second highest category of water use is evaporation from storage reservoirs
- Demand for public water supply is lower, but is growing in some areas (e.g., Logan). The public water supply is currently 100% groundwater.

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Water Use in Quay County - OSE

	Withdrawal Acre-Feet		Depletion Acre-Feet		Return Flow Acre-Feet		Totals Acre-Feet		
2000	Surface Water	Ground Water	SW	GW	SW	GW	Withdrawal	Depletion	Return Flow
Public Water Supply	0	2172	0	1256	0	917	2172	1256	917
Domestic (self-supplied)	0	138	0	138	0	0	138	11	0
Irrigated Agriculture	107954	6546	34912	8523	73042	1023	114500	40435	74065
Livestock (self-supplied)	87	792	87	792	0	0	878	878	0
Commercial (self-supplied)	0	11	0	11	0	0	11	11	0
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0
Mining (self-supplied)	0	0	0	0	0	0	0	0	0
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Reservoir Evaporation	32938	0	32938	0	0	0	32938	32938	0
TOTAL:	140979	9659	67937	7719	73042	1940	150638	75656	74982

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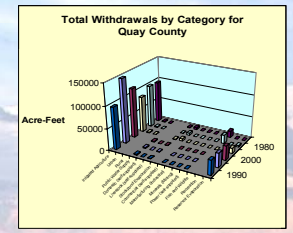
Total Withdrawal by Category



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Municipal Water Rights

Water Rights Declared (Acre-Feet)	
Total Acre-Feet Declared by Tucumcari	4720
Total Acre-Feet Declared by Logan	1,007.80
Total Acre-Feet Declared by San Jon	160.60
Total Acre-Feet Declared by House	250.00
Total Acre-Feet Declared by Nara Visa	0.00
Total Acre-Feet Declared by Forrest	0.00
Total	5,888.40

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Municipal Water Production (Acre-Feet)

	2003	2002	2001	2000	1999
Tucumcari	1,465.21	1,646.54	1,603.50	1,725.40	1,552.83
Logan	333.60	305.64	262.03	377.13	247.66
San Jon	64.51	60.70	58.75	66.62	55.61
House	37.94	24.20	21.09	13.86	12.96
Nara Visa	8.15	8.15	8.15	8.15	8.15
Forrest	3.14	3.14	3.14	3.14	3.14
Total	1912.55	2048.37	1956.66	2194.30	1880.35

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Arch Hurley Conservancy District Water Usage

Arch Hurley Conservancy District Water Usage 1946-2003						
Year	Water Released (Acre-Feet)	Water Delivered (Acre-Feet)	Delivery Efficiency	Total Acres Irrigated	Average Delivery per Acre (Acre-Feet)	Allocation (inches)
1999	95,955	46,127	48.07%	32752	1.41	18
2000	118,244	60,241	50.95%	32302	1.86	24
2001	92,519	44,852	48.48%	30987	1.45	18
2002	15,472	7,205	46.57%	19445	0.37	3
2003	0	0	0.00%	0	0.00	0
Totals	4,641,173	2,436,372	2908.95%	1,771,440	77.83	901
Average	81,424	42,743	51.03%	31,078	1.37	22
Minimum	0	0	0	0	0	0
Maximum	132,960	69,512	63.01%	37,688	2.44	48

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Annual Reservation of Ute Reservoir Water for Residential / Industrial Use

Community	Acre-Feet Reserved
Logan	400
San Jon	150
Tucumcari	6,000
Quay Co.	1,000
Quay Co. Totals	7,550
Curry County Totals	12,967
Roosevelt Co. Totals	3,483
Total UWC	24,000

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ENMRWS Cost Estimate Summary

Original Estimate (1000$)

	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Total Fixed Costs – All Phases Full Delivery	$2,151	$1,187	$48,635	$10,457	$134,266	$47,160	$243,857
Federal share (80%)	$1,721	$949	$38,908	$8,365	$107,412	$37,728	$195,086
State Share (10%)	$215	$118	$4,863	$1,045	$13,426	$4,716	$24,385
ENMRWA Member Share (10%)	$215	$118	$4,863	$1,045	$13,426	$4,716	$24,385
Sub-Total Annualized Costs	$120	$64	$2,625	$555	$7,138	$2,474	$12,978
Water Rate Projection UWC Reservation ($/1000gal)	$0.92	$1.31	$1.34	$1.71	$1.89	$2.18	$1.66

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ENMRWS Cost Estimate Summary

ENMRWS with Peer Review Estimate ($1000)

	Logan	San Jon	Tucumcari	Quay Co.	Curry Co.	Roosevelt Co.	Totals
Total Fixed Costs - All Phases Full Delivery	$2,610	$1,453	$59,159	$12,727	$163,356	$57,379	$296,688
Federal share (80%)	$2,088	$1,163	$47,327	$10,182	$130,685	$45,903	$237,350
State Share (10%)	$261	$145	$5,915	$1,272	$16,335	$5,737	$29,668
ENMRWA Member Share (10%)	$261	$145	$5,915	$1,272	$16,335	$5,737	$29,668
Sub-Total Annualized Costs	$142	$77	$3,143	$667	$8,570	$2,977	$15,579
Water Rate Projection UWC Reservation ($/1000gal)	$1.10	$1.58	$1.61	$2.05	$2.03	$2.62	$1.99

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- Prepare a drought plan
- Develop and implement city and county water conservation ordinances
- Implement AHCD agricultural water conservation plan

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- Identify water rights transfers or leases that could supply projected demand
  - Permanent or short- term transfers to deal with water shortages
    - Technical feasibility studies
    - Hydrologic investigation
    - Technical and legal fees

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- **Appropriate and reserve groundwater for the region**
  - Declared basin
    - Submit notice of intent to appropriate
    - Three years to file completed application
    - Diversion not required if 40 - year plan in place
    - Hydrologic investigations required to identify best locations for wells
  - Undeclared basin
    - No OSE jurisdiction
    - Would require diversion and application of water to beneficial use to create the water

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- Participate in ENMRWS Ute Pipeline
  - 7550 Acre-Feet Reserved By Quay County Participants
  - Current Municipal Production is approx. 2200 acre-feet
  - Reservation would meet current and projected demand based on current and future estimated demographics

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- Implement *County Water Quality Ordinances* (septic tanks)
  - On- site wastewater disposal ordinances regulate domestic/commercial wastewater disposal (septic tanks)
  - Purpose is to protect groundwater quality
  - Sets up a potential for establishing a return flow credit
  - Could integrate wellhead protection
  - Primary concern is areas with concentrations of septic tanks

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- Adopt land use plans that integrate water planning elements into new land development projects
  - Designs that incorporate water conservation
  - Incorporate water service decisions into land use plans (i.e., size pipes large enough for future growth, wastewater planning)
  - Can require developers to provide water rights
  - Can adopt impact fees to cover the costs of providing rights and infrastructure
  - Inexpensive and financially efficient (i.e., doesn't require more infrastructure than can be maintained)

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- *Water Conservation*
  - Agricultural conservation
  - Municipal conservation
  - Water conservation is cheaper per acre-foot than obtaining new supply.
  - Costs little to implement but may impact utility revenue.
  - Rate restructuring may be necessary.

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- Recycle municipal wastewater
  - **Must obtain an NMED permit to discharge to groundwater.**
  - **NPDES permit required for surface water discharge.**
  - **Class 1A Reclaimed Wastewater: the highest quality reclaimed wastewater and can be most broadly utilized except for direct consumption.**
  - **Class 1B Reclaimed Wastewater: the second highest quality reclaimed wastewater described in this Policy and is suitable for uses in which public exposure is likely.**
  - **Class 2 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is restricted.**
  - **Class 3 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is prohibited.**
  - **Tucumcari effluent discharged to the Pajarito Creek**

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Possible Alternatives – Waste water Reuse

Class of Reclaimed Wastewater	Approved Uses
Class 1A	All Class 1 uses. *No setback limit* to dwelling unit or occupied establishment.; Backfill around potable water pipes ; Irrigation of food crops
Class 1B	Impoundments (recreational or ornamental) ;Irrigation of parks, school yards, golf courses ; Irrigation of urban landscaping ; Snow making ; Street cleaning ; Toilet flushing ; Backfill around non-potable piping
Class 2	Concrete mixing ; Dust control ; Irrigation of fodder, fiber, and seed crops for milk-producing animals ; Irrigation of roadway median landscapes ;Irrigation of sod farms; Livestock watering ; Soil compaction
Class 3	Irrigation of fodder, fiber, and seed crops for non-milk-producing animals ; Irrigation of forest trees (silviculture)

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Possible Alternatives for Inclusion in Quay County 40 Year Water Plan

- *Watershed Management*
  - Management actions that protect water quality
  - Management actions that enhance yield
  - Limited by annual precipitation
  - Careful treatments should minimize adverse effects on water quality and downstream aquatic resources

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Slide 33

Additional Alternatives for the Quay County 40 Year Water Plan

- Implement efficiencies in municipal water supply management (e.g., leak detection)
- Increase water rates
- Xeriscape to conserve (municipal) water
- Reduce losses by lining ditches and encasing delivery systems
- Develop unappropriated groundwater to meet projected demand
- Implement cloud seeding projects
- Upgrade mains

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Additional Alternatives for the Quay County 40 Year Water Plan

- Require water quality study for all development projects
- Implement point and non-point source projects
- Draft and implement source water and well-head protection plans for key water supplies
- Construct sewer systems to replace septic tanks (i.e. Logan) and construct wastewater treatment or wetlands to protect groundwater from septic system contamination
- Develop and implement city ordinances to control private wells

4/8/2004 34

Slide 35

Alternatives Selected for Analysis

- Based on ISC water planning template
  Each alternative analysis includes:
  - Technical feasibility
  - Financial feasibility
  - Social, political and cultural issues
  - Physical, hydrological, and environmental impacts
  - Implementation schedule

4/8/2004 35

Slide 36

Benefit / Cost Analysis

- Decision making process
- Value of water savings for the project divided by the cost of the project
- If result is greater than 1, project has greater benefit than cost

4/8/2004 36

Slide 37

Implementation Actions

- Public education and outreach (Schools)
- Distribute materials (i.e., through water bills)
- Interaction with political leaders to develop support for water plan implementation and any needed legislation
- Funding for continued planning and implementation of projects

4/8/2004 37

Slide 38

Concerns

- Keeping water in the region
- Preserving water for the future
- Maintaining water quality
- Integrating regional goals and visions into all types of planning and regulation

4/8/2004 38

Slide 39

Questions and Comments

- The comment sheets have the alternatives listed. Please help us by listing what you feel are the highest five alternatives to be considered. There is space to add alternatives to be considered.
- There is also space on the back of the comment sheet so you will have room to comment.

4/8/2004 39

Slide 40

Thank You for attending this meeting.

We plan to have a draft plan available for review in April. The drafts will be available at the City of Tucumcari, Village of Logan, Village of San Jon, Village of House, and at the Quay County Manager's Office.

4/8/2004 40

Copies of Sign In Sheets for the Public Meetings

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/10/2004 **Village of Logan**

Name	Address
[illegible] Frost	P.O. Box 622 Logan N.M.
Lary Wallin	Box 355 Logan, N.M. 88426
[illegible]	1501 540 Loop Logan N.M. "
John R Vigil	700 Vigil St. Logan N.M
Ruby Vigil	" "
David Babb	PO Box 396 Logan NM
Larry Thomas	PO Box 157 Logan, NM 88426
Zeffie Babb	
Apolonio Ramirez	P.O. Box 351, Logan, NM 88426

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/10/2004 **Village of Logan**

Name	Address
Joe Herbel	
[illegible]	
Jesse Locke	
Scott Verhines	ENMRWA Albuquerque, NM
George Ervin	Box 206 Logan, NM 88426
Jay & Lee Locke	Box 645 Logan NM 88426
Melvin Rose	107 Mockingbird Lane NM 88426
B Pierce + Jimmie Pierce	6213 540 Loop, Logan 88426
Johnny Irving	PO Box 333 Logan 88426
Martha Reid	610 Pass Cly Logan 88426
[illegible]	303 Trent Logan 88426
Lynda Jeffers	119 Cain Rd Logan 88426
Will Cantrell	Box 1242 Tucumcari NM 88401
Judy Westall	123 Yuma Logan 88426
Harold Westall	— —
Mike Kerchenville	Logan
Rita Holman	PO Box 403 Logan
Lynd Cole	PO BOX 612 Logan
[illegible]	902 TROUT
Rose Kelly	
Dora Weibel	Logan
[illegible] Jones	Logan 415 N. 2nd
Alice Jones	Logan " "
[illegible] Mitchell	Logan
Rosemarie [illegible]	"
Michael L. Barnes	2108 So 8th Tucumcari, NM 88401

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/10/04 **Village of San Jon**

Name	Address
JOE CLARK	P.O. BOX 336 SAN JON
Rodney Stoner	519 E Cherry Ave San Jon
Scott Verhines	ENMRWA 4300 San Mateo NE, ABQ, NM.
Larry Martinez	608 Elizabeth Ave San Jon N.M.
LINDA BRILL	EPCOG 418 N MAIN, CLOVIS, NM 88101
Dennis Carramenupe	EPCOG 418 Main, Clovis, NM 88101
Billie Jo Barron	Box 145 San Jon NM
Cynthia Lee	PO Box 14 San Jon
JIM LAFFERTY	2610 S. 4th TUCUMCARI
Ben [illegible]	PO BOX 205 SAN JON NM 88434
Leo [illegible]	PO Box 49 San Jon, NM 88434
Rosalie Rachor	PO Box 37, San Jon
Wade Lane	" "
MICHAEL L. BARNES	2108 South 8th TUCUMCARI, NM 88401

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/10/04 **Village of San Jon**

Name	Address
JOE CLARK	P.O. BOX 336 SAN JON
Rodney Stoner	519 E Cherry Ave San Jon
Scott Verhines	ENMRWA 4300 San Mateo NE, ABQ, NM.
Larry Martinez	608 Elizabeth Ave San Jon N.M.
LINDA BRILL	EPCOG 418 N MAIN, CLOVIS, NM 88101
Dennis Carramenupe	EPCOG 418 Main, Clovis, NM 88101
Billie Jo Barron	Box 145 San Jon NM
Cynthia Lee	PO Box 14 San Jon
JIM LAFFERTY	2610 S. 4th TUCUMCARI
Ben [illegible]	PO BOX 205 SAN JON NM 88434
Leo [illegible]	PO Box 49 San Jon, NM 88434
Rosalie Rachor	PO Box 37, San Jon
Wade Lane	" "

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/9/2004 **Quay County**

Name	Address
David Foote	4343 QR 63 Tucumcari NM 88401
Bob Morgan	P.O. Box 645 Tucumcari NM 88401
George Fyette	Box 1128 Tucumcari N.M. 88401
Alan Bugg	PO Box 1012 Tucumcari 88401
Marylhelen Follingstad	NMISC P.O. Box 25103, SANTA FE, NM 87504
Scott Verhines	ENMRWA 4300 San Mateo NE B150 ABQ, NM 87110
Terry Turner	1102 Marigold Ln NE Albuquerque NM 87112
Michael Barnes	2108 So 8th Tucumcari, NM 88401
Joe Paul Lowrimore	P.O. Box 741 Tucumcari N.M. 88401
Grace Pickard	6380 Cedar St. Tucumcari, N.M. 88401
Franklin McCasland	3433 Quay Road 58 Tucumcari, NM 88401

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/9/2004 **City of Tucumcari**

Name	Address
Charlie Sandoval	P.O. Box 1188, Tuc., NM 88401
Richard Primrose	P.O. Box 1188 Tuc, NM 8840
Mary Mayfield	812 Illinois Tuc. NM 88401
Joe Ramirez	P.O. Box 1188 Tucumcari NM 88401
Pat Petrak	PO Box 665 House NM 88121
Calvin Litchfield	Box 947 Tucumcari 88401
Antonio Apodaca	409 N. 3d City
Clara L. Rey	P.O. Box 1188 Tuc. NM 88401
Doug Powell	P.O. Box 1188 Tuc. NM 88401
Leo Thrasher	Box 1228, Tuc 88401
Virginia Wright	PO Drawer E Tuc 88401
Michael L. Barnes	2108 So 8th Tuc. 88401
Scott Verhines	ENMRWA 4300 San Mateo NE B150 ABQ 87110

Quay County 40 Year Water Plan
Public Meeting
Sign-In Sheet

2/11/2004 **Village of House**

Name	Address
Floyd Morrow	PO Box 702
Linda Lavender	PO Box 682 House NM 88121
Eileen Dargrove	P.O. Box 844 House NM 88121
Delmy Poe	P.O. Box 848 House, NM 88121
Jimmie Joe Jeter	RT 1 Box 55 McAlister NM 88427
Mike Morrow	P.O. Box 694 House N.M. 88121
Pow Carter	Box 516 Fort Sumner NM 88119
Sherman W. Marsh	Box 696 House N.M.
Judy Morrow	Box 674 House NM 88121

Comment Sheets Returned

Quay County 40 Year Water Plan
Comment Sheet

Date: 2/11/04
Name: Village of House
Address: PO Box 682
Organization: Village Council
Phone: 279-7372 Fax: 279-6053 Email: village_house@plateautel.net

Priority	Alternative
4	Prepare a drought plan
	Develop and implement city and county water conservation ordinances
	Implement AHCD agricultural water conservation plan
	Identify water rights transfers or leases that could supply projected demand
1	Appropriate and reserve groundwater for the region
	Participate in ENMRWS Ute Pipeline
	Implement County Water Quality Ordinances
	Adopt land use plans that integrate water planning elements
	Water Conservation
	Agricultural conservation
3	Municipal conservation
	Recycle municipal wastewater
	Watershed Management
	Implement efficiencies in municipal water supply management (e.g., leak detection)
5	Increase water rates
	Xeriscape to conserve (municipal) water
	Reduce losses by lining ditches and encasing delivery systems
	Develop unappropriated groundwater to meet projected demand
	Implement cloud seeding projects
	Upgrade mains
	Require water quality study for all development projects
	Implement point and non-point source projects
	Draft and implement source water and well- head protection plans for key water supplies
2	Construct sewer systems
	Develop and implement city ordinances to control private wells

Comments

Hand in at end of meeting or mail to:
Michael L. Barnes
2108 South Eighth Street
Tucumcari, NM 88401

Additional space for comments on back

Quay County 40 Year Water Plan
Comment Sheet

Date: Jan 10 2009

Name: James Doorny

Address: Box 478

Organization:

Phone: 487 3266 | Fax: | Email:

Priority	Alternative
✓	Prepare a drought plan
✓	Develop and implement city and county water conservation ordinances
	Implement AHCD agricultural water conservation plan
	Identify water rights transfers or leases that could supply projected demand
✓	**Appropriate and reserve groundwater for the region**
✓	Participate in ENMRWS Ute Pipeline
	Implement County Water Quality Ordinances
	Adopt land use plans that integrate water planning elements
	Water Conservation
	Agricultural conservation
	Municipal conservation
	Recycle municipal wastewater
	Watershed Management
	Implement efficiencies in municipal water supply management (e.g., leak detection)
	Increase water rates
	Xeriscape to conserve (municipal) water
✓	Reduce losses by lining ditches and encasing delivery systems
	Develop unappropriated groundwater to meet projected demand
	Implement cloud seeding projects
	Upgrade mains
	Require water quality study for all development projects
	Implement point and non-point source projects
	Draft and implement source water and well- head protection plans for key water supplies
	Construct sewer systems
	Develop and implement city ordinances to control private wells

Comments

Hand in at end of meeting or mail to:
Michael L. Barnes
2108 South Eighth Street
Tucumcari, NM 88401

Additional space for comments on back

Quay County 40 Year Water Plan
Comment Sheet

Date: 02-09-04
Name: Marcy Mayfield
Address: 812 E Alden Tucumcari
Organization: Retired
Phone: 505-461-2998 Fax: Email:

Priority	Alternative
	Prepare a drought plan
2 ✓	Develop and implement city and county water conservation ordinances
	Implement AHCD agricultural water conservation plan
	Identify water rights transfers or leases that could supply projected demand
	Appropriate and reserve groundwater for the region
1 ✓	Participate in ENMRWS Ute Pipeline
	Implement County Water Quality Ordinances
	Adopt land use plans that integrate water planning elements
	Water Conservation
	Agricultural conservation
	Municipal conservation
4 ✓	Recycle municipal wastewater
	Watershed Management
	Implement efficiencies in municipal water supply management (e.g., leak detection)
5 ✓	Increase water rates
	Xeriscape to conserve (municipal) water
	Reduce losses by lining ditches and encasing delivery systems
	Develop unappropriated groundwater to meet projected demand
	Implement cloud seeding projects
	Upgrade mains
	Require water quality study for all development projects
	Implement point and non-point source projects
3 ✓	Draft and implement source water and well- head protection plans for key water supplies
	Construct sewer systems
	Develop and implement city ordinances to control private wells

Comments

Hand in at end of meeting or mail to:
Michael L. Barnes
2108 South Eighth Street
Tucumcari, NM 88401

Additional space for comments on back

Quay County 40 Year Water Plan
Comment Sheet

Date	2-9-04
Name	Patricia A Petrak
Address	P O Box 665, House NM 88121
Organization	City Tucumcari - LABORATORY
Phone: 461-4372	Fax: 461-4372 Email: lab@cityoftucumcari.com

Priority	Alternative
	Prepare a drought plan
	Develop and implement city and county water conservation ordinances
	Implement AHCD agricultural water conservation plan
	Identify water rights transfers or leases that could supply projected demand
3	Appropriate and reserve groundwater for the region
	Participate in ENMRWS Ute Pipeline
	Implement County Water Quality Ordinances
	Adopt land use plans that integrate water planning elements
	Water Conservation
4	Agricultural conservation
	Municipal conservation
1	Recycle municipal wastewater
	Watershed Management
	Implement efficiencies in municipal water supply management (e.g., leak detection)
	Increase water rates
	Xeriscape to conserve (municipal) water
5	Reduce losses by lining ditches and encasing delivery systems
	Develop unappropriated groundwater to meet projected demand
	Implement cloud seeding projects
	Upgrade mains
2	Require water quality study for all development projects
	Implement point and non-point source projects
	Draft and implement source water and well- head protection plans for key water supplies
	Construct sewer systems
	Develop and implement city ordinances to control private wells

Comments

I would like to see copies of the water chemistry from the lake study.

Hand in at end of meeting or mail to:
Michael L. Barnes
2108 South Eighth Street
Tucumcari, NM 88401

Additional space for comments on back

Quay County 40 Year Water Plan
Comment Sheet

Date

Name: Tom Anderson

Address: Talked to Mr Anderson 2/12 & received this info over phone. MLB

Organization

Phone: 461-1584 Fax: Email:

Priority	Alternative
	Prepare a drought plan
	Develop and implement city and county water conservation ordinances
	Implement AHCD agricultural water conservation plan
✓	Identify water rights transfers or leases that could supply projected demand
(1)	**Appropriate and reserve groundwater for the region**
✓	Participate in ENMRWS Ute Pipeline
	Implement County Water Quality Ordinances
	Adopt land use plans that integrate water planning elements
	Water Conservation
	Agricultural conservation
	Municipal conservation
	Recycle municipal wastewater
	Watershed Management
	Implement efficiencies in municipal water supply management (e.g., leak detection)
✓	Increase water rates — Adjust Water Rates to enhance Conservation.
	Xeriscape to conserve (municipal) water
	Reduce losses by lining ditches and encasing delivery systems
	Develop unappropriated groundwater to meet projected demand
	Implement cloud seeding projects
	Upgrade mains
	Require water quality study for all development projects
	Implement point and non-point source projects
	Draft and implement source water and well- head protection plans for key water supplies
	Construct sewer systems
	Develop and implement city ordinances to control private wells
✓	Reduce Evaporation - Layer to Reduce Evaporation of Reservoir.

Comments

- ENMRWS - Important Project.
- Age of Projects → → → → → 100 year life of Reservoir & Conserv.

Hand in at end of meeting or mail to:
Michael L. Barnes
2108 South Eighth Street
Tucumcari, NM 88401

Additional space for comments on back

Quay County 40 Year Water Plan
Comment Sheet

Date: Feb. 10, 2004 Meeting in Logan
Name: Harold & Judy L. Westall
Address: 123 Yuma St. Logan NM 88426
Organization: Retired
Phone: (505) 487-5034 Fax: — Email: —

Priority	Alternative
2	Prepare a drought plan
1	Develop and implement city and county water conservation ordinances
	Implement AHCD agricultural water conservation plan
11	Identify water rights transfers or leases that could supply projected demand
3	**Appropriate and reserve groundwater for the region**
4	Participate in ENMRWS Ute Pipeline
12	Implement County Water Quality Ordinances
	Adopt land use plans that integrate water planning elements
5	Water Conservation
7	Agricultural conservation
6	Municipal conservation
	Recycle municipal wastewater
	Watershed Management
	Implement efficiencies in municipal water supply management (e.g., leak detection)
13	Increase water rates
	Xeriscape to conserve (municipal) water
	Reduce losses by lining ditches and encasing delivery systems
	Develop unappropriated groundwater to meet projected demand
	Implement cloud seeding projects
8	Upgrade mains
	Require water quality study for all development projects
	Implement point and non-point source projects
9	Draft and implement source water and well- head protection plans for key water supplies
10	Construct sewer systems
	Develop and implement city ordinances to control private wells I think this is out of scope of cities.

Comments

#8 If there is significant loss of water in mains.

#4 Logan should participate in this and when possible use this water and conserve ground water that is available.

#13 Water rates should only be increased to cover production of water & upkeep on system.

No tax payer money should be spent on cloud seeding, if farmers think it would benefit them they should be willing to bear the cost of same.

Hand in at end of meeting or mail to:
Michael L. Barnes
2108 South Eighth Street
Tucumcari, NM 88401

Additional space for comments on back

Quay County 40 Year Water Plan
Comment Sheet

If conditions of the past year, 2003, persist it will require very restrictive water use. State, County, and City officials will be faced with having to make some unpopular choices for conservation of water and will have to keep this constituents informed where possible.

Public Review Notice for Draft 40 Year Water Plan

NOTICE OF PUBLIC REVIEW
QUAY COUNTY 40 YEAR WATER PLAN

The City of Tucumcari, Village of Logan, Village of San Jon, Village of House and Quay County have published the 40 Year Water Plan for Public Review.

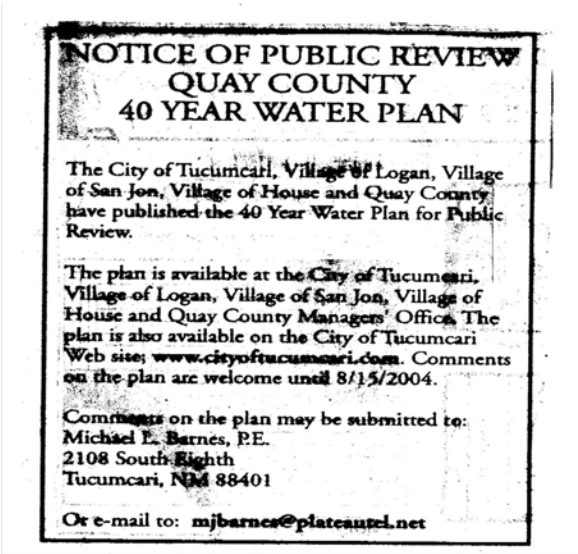
The plan is available at the City of Tucumcari, Village of Logan, Village of San Jon, Village of House and Quay County Managers' Office. The plan is also available on the City of Tucumcari Web site; **www.cityoftucumcari.com**. Comments on the plan are welcome until 8/15/2004.

Comments on the plan may be submitted to:

Michael L. Barnes, P.E.
2108 South Eighth
Tucumcari, NM 88401

Or e-mail to: mjbarnes@plateautel.net

Scanned Copy of Notice from Quay County Sun Newspaper



NOTICE OF PUBLIC REVIEW
QUAY COUNTY
40 YEAR WATER PLAN

The City of Tucumcari, Village of Logan, Village of San Jon, Village of House and Quay County have published the 40 Year Water Plan for Public Review.

The plan is available at the City of Tucumcari, Village of Logan, Village of San Jon, Village of House and Quay County Managers' Office. The plan is also available on the City of Tucumcari Web site; www.cityoftucumcari.com. Comments on the plan are welcome until 8/15/2004.

Comments on the plan may be submitted to:
Michael L. Barnes, P.E.
2108 South Eighth
Tucumcari, NM 88401

Or e-mail to: mjbarnes@plateautel.net

Appendix C - Water Rights Information

C.1 Introduction

For purposes of the 40 year water plan and to provide general information for stakeholders in the region, this section outlines the basic concepts of water law in New Mexico. Water planning efforts are subject to "laws relating to impact on existing water rights"(NMSA 72-14-44C (7)). New Mexico water law is codified in Chapters 72 (Water Code) and 73 (Special Districts) of New Mexico Statutes Annotated (NMSA Chapter 72, Articles 1-19; Chapter 73, Articles 1-23).

CHAPTER 72
WATER LAW

Article	Description
1.	Water Rights in General, 72-1-1 through 72-1-10.
2.	State Engineer, 72-2-1 through 72-2-18.
3.	Water Districts and Water Masters, 72-3-1 through 72-3-5.
4.	Surveys, Investigations and Adjudication of Rights, 72-4-1 through 72-4-20.
4A.	Water Project Finance, 72-4A-1 through 72-4A-10.
5.	Appropriation and Use of Surface Water, 72-5-1 through 72-5-39.
5A.	Ground Water Storage and Recovery, 72-5A-1 through 72-5A-17.
6.	Water-Use Leasing, 72-6-1 through 72-6-7.
7.	Appeals from State Engineer, 72-7-1 through 72-7-3.
8.	Offenses and Penalties Under Water Act of 1907, 72-8-1 through 72-8-6.
9.	Application of Water Act of 1907, 72-9-1 through 72-9-4.
10.	Community Uses, 72-10-1 through 72-10-10.
11.	Salt Lakes, 72-11-1.
12.	Underground Waters, 72-12-1 through 72-12-28.
12A.	Mine Dewatering, 72-12A-1 through 72-12A-13.
12B.	Use of Waters Outside the State, 72-12B-1 through 72-12B-2.
13.	Artesian Wells, 72-13-1 through 72-13-12.
14.	Interstate Stream Commission; Protection of Interstate Streams, 72-14-1 through 72-14-44.
15.	Interstate Compacts, 72-15-1 through 72-15-28.
16.	Albuquerque Metropolitan Arroyo Flood Control, 72-16-1 through 72-16-103.
17.	Las Cruces Metropolitan Arroyo Flood Control, 72-17-1 through 72-17-103.
18.	Flood Control Districts, 72-18-1 through 72-18-70.
19.	Southern Sandoval County Flood Control, 72-19-1 through 72-19-103.

Chapter 73 details the powers and authorities of various water management agencies in the State such as conservancy districts, irrigation districts, and soil and water conservation districts, among others.

CHAPTER 73
SPECIAL DISTRICTS

Article	Description
1.	Artesian Conservancy Districts, 73-1-1 through 73-1-27.
2.	Ditches or Acequias, 73-2-1 through 73-2-68.
2A.	Acequia and Community Ditch Fund, 73-2A-1 through 73-2A-3.
3.	Ditches or Acequias; Special Provisions Governing Certain Counties, 73-3-1 through 73-3-11.
4.	Mill Ditches, 73-4-1 through 73-4-4.
5.	Water Users' Associations, 73-5-1 through 73-5-9.
6.	Drainage Districts; Formation, 73-6-1 through 73-6-44.
7.	Drainage Districts; Construction, Operation and Maintenance, 73-7-1 through 73-7-56.
8.	Drainage Districts Within Federal Reclamation Projects, 73-8-1 through 73-8-60.
9.	Irrigation Districts, 73-9-1 through 73-9-62.
10.	Irrigation Districts Cooperating with United States Under Reclamation Laws; Formation and Management, 73-10-1 through 73-10-50.
11.	Irrigation Districts Cooperating with United States Under Reclamation Laws; Fiscal Affairs; Local Improvements and Special Powers, 73-11-1 through 73-11-55.
12.	Electrical Irrigation Districts, 73-12-1 through 73-12-57.
13.	General Provisions Relating to Irrigation Districts, 73-13-1 through 73-13-47.
14.	Conservancy Districts; Definitions; Organization and Management, 73-14-1 through 73-14-92.
15.	Conservancy Districts; Appraisal of Benefits, 73-15-1 through 73-15-15.
16.	Conservancy Districts; Financial Administration, 73-16-1 through 73-16-53.
17.	Conservancy Districts; General Provisions, 73-17-1 through 73-17-24.
18.	Conservancy Districts; Reclamation Contracts, 73-18-1 through 73-18-43.
19.	Tri-State Water Conservancy Association, 73-19-1 through 73-19-5.
20.	Soil and Water and Watershed Conservation Districts, 73-20-1 through 73-20-49.
21.	Water and Sanitation Districts, 73-21-1 through 73-21-55.
22.	Wind Erosion Districts, 73-22-1 through 73-22-5.
23.	Repealed.
24.	Joint Flood and Drainage Planning Assessments, 73-24-1 through 73-24-4.
25.	Regional Transit District, 73-25-1 through 73-25-18.

Article XVI of the New Mexico Constitution establishes the basic principles underlying New Mexico water law, including prior appropriation and beneficial use:

> New Mexico follows the doctrine of Prior Appropriation which is a property right in the use of water is created by diversion of water from a stream or aquifer and its application to a beneficial use. Water can be used at any location, without regard to the position of place of use in relation to the stream. In the event of a shortage of supply, water will be supplied to users up to the limit of their right in order of priority: the last person to divert and make use of the stream is the first to have his supply cut off.
>
> The origin of the doctrine of Prior Appropriation existed under the Mexican Republic at the time the United States acquired the Territory of New Mexico. The doctrine became

the settled law of this territory as a result of legislation, custom and judicial decision. Prior appropriation was the Mexican law, as well as the law of Indian tillers of the soil.

Priority date is the date action is initiated to acquire the water right through appropriation, not the date when water is first applied to beneficial use. If a State Engineer permit is required, the priority is the date of the permit application. The priority date is the basis that water is allocated when rights to take from a source exceed the available supply.

The term "Beneficial Use" is not defined in the New Mexico Constitution, the statutes, nor specifically in court decisions. Normally, the term beneficial use is used for some purpose that is socially accepted as beneficial. Beneficial use includes use for agricultural, municipal, domestic, commercial and industrial purposes.

Pre-1907 water rights are surface waters that were diverted for beneficial use in New Mexico prior to the adoption in 1907 of the New Mexico Water Code. No permit was required to appropriate public waters before 1907, and such water rights are evidenced in the State Engineer's office only by water right declarations, unless, after 1907, the right has been transferred to another location or use, in which case the State Engineer's office records will contain a permit authorizing a transfer. The 1907 Water Code codified the prior appropriation doctrine and established the Office of the Territorial Engineer to supervise a permit system for water right appropriations and transfers.

"Beneficial use shall be the basis, the measure and the limit of a water right" (N.M. Constit. Art. XVI, S2). This provision has been incorporated into case law as well. As ruled in *State ex rel. Reynolds v. Mendenhall,* beneficial use is the "measure and limit of the right to the use of waters" (68 N.M. 467 (1961)).

C.2 Administration of Groundwater and Surface Water in New Mexico

The OSE has been granted the authority by the legislature to administer Surface and Ground Water for New Mexico. The New Mexico Administrative code includes administrative requirements for water administration through the OSE.

72-2-1. Appointment; removal; qualifications; duties; office; private practice prohibited. (1982)

Statute text

There shall be a "state engineer" who shall be a technically qualified and registered professional engineer under the Engineering and Land Surveying Practice Act [Chapter 61, Article 23 NMSA 1978] and shall be appointed by the governor and confirmed by the senate. He shall hold office for the term of two years or until his successor has been appointed and has qualified. He is subject to removal only for cause. He has general supervision of waters of the state and of the measurement, appropriation, distribution thereof and such other duties as required. The salary of the state engineer shall be set by the governor, and he shall receive necessary traveling expenses while away from his office in the discharge of official duties pursuant to the provisions of the Per Diem and Mileage Act [10-8-1 to 10-8-8 NMSA 1978]. The office of the state engineer shall be located at the seat of government. He shall not engage in any private practice.

History

History: Laws 1907, ch. 49, § 4; Code 1915, § 5657; Laws 1919, ch. 46, § 1; C.S. 1929, § 151-104; Laws 1937, ch. 178, § 1; 1947, ch. 142, § 1; 1941 Comp., § 77-201; 1953 Comp., § 75-2-1; Laws 1971, ch. 234, § 10; 1977, ch. 254, § 92; 1982, ch. 10, § 3.

New Mexico Administrative Code
TITLE 19 NATURAL RESOURCES AND WILDLIFE
CHAPTER 1 NATURAL RESOURCES GENERAL PROVISIONS
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The New Mexico Water Code was not made applicable to groundwater until 1931 and then only in declared groundwater basins. After an underground basin is declared by the State Engineer, no lawful appropriation can occur without a State Engineer issued permit. Appropriations and transfers of water rights within an area not within a declared groundwater basin are accomplished without State Engineer involvement.

The Water Code provides with the OSE the authority to delineate groundwater basins that require a permit for groundwater withdrawals, referred to as “declared underground water basins.”

NMAC STATUTORY AUTHORITY FOR DECLARING UNDERGROUND BASINS

Sections 72-1-1, 72-2-1, 72-2-8, 72-12-1, 72-12-3, 72-12-28 NMSA 1978 (Repl. Pamp. 1985 and Cum. Supp. 1996).

[3/11/98; Recompiled 12/31/01]

72-2-8. Administrative regulations, codes, instructions, orders; presumption of correctness. (1967)

Statute text

A. The state engineer may adopt regulations and codes to implement and enforce any provision of any law administered by him and may issue orders necessary to implement his decisions and to aid him in the accomplishment of his duties. In order to accomplish its purpose, this provision is to be liberally construed.

B. Directives issued by the state engineer shall be in form substantially as follows:

(1) regulations are written statements of the state engineer of general application to the public, implementing statutes, prescribing procedures and interpreting and exemplifying the statutes to which they relate;

(2) codes are written standards and specifications governing design and construction of dams;

(3) orders are written statements of the state engineer to implement his decision;

(4) special orders are written statements defining the declared boundaries of underground streams, channels, artesian basins, reservoirs or lakes.

C. To be effective, a regulation, code or special order issued by the state engineer shall be reviewed by the attorney general or other legal counsel of the state engineer's office prior to being filed as required by law and the fact of his review shall be indicated thereon.

D. To be effective, a regulation or code shall first be issued as a proposed regulation or proposed code and filed for public inspection in the office of the state engineer along with the findings of fact that in the opinion of the state engineer justify the regulation or code. Distribution shall also be made to each district and field office for public inspection and to each of the persons on the file of interested persons hereinafter mentioned. After the proposed regulation or code has been on file for one month, he shall publish it, or if it is lengthy, a resume of it, in not less than five newspapers of general circulation in the state, once a week for two consecutive weeks, with the statement that there will be a hearing on the proposed regulation or code on a day set in the publication, which shall be not more than thirty days nor less than twenty days after the last publication. The hearing shall be held in Santa Fe, and any person who is or may be affected by the proposed regulation or code may appear and testify.

E. Special orders may be promulgated without prior notice and hearing, but the state engineer shall, within ten days of promulgation of a special order, set a date for a hearing on the special order, and publish notice of the public hearing in the same manner required above.

F. In addition to filing copies of regulations as required by law, the state engineer shall maintain in his office duplicate official sets of current regulations, codes and special orders, which sets shall be available for inspection by the public.

G. The state engineer shall develop and maintain a file of names and addresses of individuals, professional, agricultural and other groups having an interest in the promulgation of new, revised or proposed regulations and shall at convenient times distribute to these persons all such regulations, making such charges therefor as will defray the expense incurred in their physical preparation and mailing.

H. Any regulation, code or order issued by the state engineer is presumed to be in proper implementation of the provisions of the water laws administered by him.

I. The state engineer shall state the extent to which regulations, codes and orders will have retroactive effect and, if no such statement is made, they will be applied prospectively only.

History

History: 1953 Comp., § 75-2-8, enacted by Laws 1967, ch. 246, § 1.

72-12-5. [Declaration of beneficial use; verification; recording.] (1931)Statute text

Any person, firm or corporation claiming to be the owner of a vested water right from any of the underground sources in this act [72-12-1 to 72-12-10 NMSA 1978] described, by application of waters therefrom to beneficial use, may make and file in the office of the state engineer a declaration in a form to be prescribed by the state engineer setting forth the beneficial use to which said water has been applied, the date of first application to beneficial use, the continuity thereof, the location of the well and if such water has been used for irrigation purposes, the description of the land upon which such water has been so used and the name of the owner thereof. Such declaration shall be verified but if the declarant cannot verify the same of his own personal knowledge he may do so on information and belief. Such declarations so filed shall be recorded at length in the office of the state engineer and may also be recorded in the office of the county clerk of the county wherein the well therein described is located. Such records or copies thereof officially certified shall be prima facie evidence of the truth of their contents.

History

History: Laws 1931, ch. 131, § 5; 1941 Comp., § 77-1105; 1953 Comp., § 75-11-5.

72-12-20. When appropriation without permit allowed. (1983)Statute text

No permit and license to appropriate underground waters for in-state use shall be required except in basins declared by the state engineer to have reasonably ascertainable boundaries.

History

History: 1941 Comp., § 75-1121, enacted by Laws 1953, ch. 64, § 3; 1953 Comp., § 75-11-21; 1983, ch. 2, § 5.

19.27.1.8 NMAC DECLARATION OF EXISTING WATER RIGHTS; INITIATION OF WATER RIGHTS

DECLARATIONS, AFFIDAVITS - FILING: If declarations of existing water rights are filed as permitted by Section 75-11-5, [72-12-5 NMSA 1978] they shall be prepared in triplicate on forms furnished by the state engineer and shall be accompanied by the proper filing fee (Article 6-1) [now 19.25.5.8 NMAC]. Declarations may also be accompanied by affidavits of persons having personal knowledge of the history of the works or by other evidence tending to substantiate the claims and by copies of well logs, if available. If such supporting documents are filed in the state engineer office, they will be filed together with the declaration.

[SE-66-1 Article 1-1, Recompiled 12/31/01]

19.27.1.9 NMAC APPLICATIONS TO APPROPRIATE – PRIORITY

Where the well is to be drilled within the boundaries of a declared underground water basin (Article 7) [now 19.27 NMAC] application to appropriate shall be filed in triplicate on forms provided by the state engineer accompanied by the proper filing fee (Article 6-1) [now 19.25.5.8 NMAC]. The date of receipt of an application by the state engineer or his authorized representative shall be endorsed thereon. The date of filing establishes the original priority date of any application, subject to the acceptance of the application

and the issuance of a permit by the state engineer and the timely application of water to beneficial use.

[SE-66-1 Article 1-2, Recompiled 12/31/01]

In order to withdraw water from declared basins, a user must put water to beneficial use prior to the declaration of the basin, have a declared water right, or obtain a water permit from the OSE that specifies (1) how much water a user can withdraw within any given year, (2) the location and type of well that will be used to withdraw the water, and (3) the use to which the water will be put.

Diversion of water from New Mexico's surface waters also requires obtaining a water permit from the OSE. Surface water appropriations follow the same standards as groundwater rights in that a transfer, sale, or lease cannot impair existing water rights and must not be contrary to public welfare or conservation. Many of New Mexico's surface waters are governed by interstate compacts that require set amounts of water to be delivered to specific delivery points specified in the compacts.

In particular, the Canadian River is subject to compact requirements for delivery of water to the State of Texas. The Interstate Stream Commission has responsibility for ensuring that specific rivers in New Mexico meet their obligations under the interstate compacts.

C.3 Water Right Ownership

72-1-2. [Water rights; appurtenant to land; priorities.] (1907)Statute text

Beneficial use shall be the basis, the measure and the limit of the right to the use of water, and all waters appropriated for irrigation purposes, except as otherwise provided by written contract between the owner of the land and the owner of any ditch, reservoir or other works for the storage or conveyance of water, shall be appurtenant to specified lands owned by the person, firm or corporation having the right to use the water, so long as the water can be beneficially used thereon, or until the severance of such right from the land in the manner hereinafter provided in this article. Priority in time shall give the better right. In all cases of claims to the use of water initiated prior to March 19, 1907, the right shall relate back to the initiation of the claim, upon the diligent prosecution to completion of the necessary surveys and construction for the application of the water to a beneficial use. All claims to the use of water initiated thereafter shall relate back to the date of the receipt of an application therefor in the office of the territorial or state engineer, subject to compliance with the provisions of this article, and the rules and regulations established thereunder.

History: Laws 1907, ch. 49, § 2; Code 1915, § 5655; C.S. 1929, § 151-102; 1941 Comp., § 77-102; 1953 Comp., § 75-1-2.

Ownership of water rights is created by diversion and application to beneficial use. It may be demonstrated administratively through the declaration or permit process. In the case of groundwater rights, a declaration may be filed for water uses that arose prior to the declaration of the groundwater basin. A water right declarant "may make and file in the office of the state engineer a declaration in a form with the date of first application to beneficial use, continuity thereof, location, and description of the land where used" (NMSA 72-1-3). However, this declaration constitutes only claim of ownership and does not guarantee that the individual filing the declaration will be entitled to the entire amount of water claimed. Individuals who wish to acquire a new water right must file a permit application with the OSE and go through the entire permitting process (described in Section D.3.1). Permits are granted only for unappropriated waters of the State.

The judicial recognition of water rights on a stream system takes place through an adjudication. An adjudication is "a suit for the determination of a right to use the waters of any stream system"

(NMSA 72-4-17). Upon completion of the adjudication proceeding, an order and decree is entered establishing the priority, amount, purpose, periods and place of use, and specific tracts of land to which the right is appurtenant.

72-1-9. Municipal, county, member-owned community water systems and state university water development plans; preservation of municipal, county and state university water supplies. (2003)

Statute text

A. It is recognized by the state that it promotes the public welfare and the conservation of water within the state for municipalities, counties, state universities, member-owned community water systems, special water users' associations and public utilities supplying water to municipalities or counties to plan for the reasonable development and use of water resources. The state further recognizes the state engineer's administrative policy of not allowing municipalities, member-owned community water systems, counties and state universities to acquire and hold unused water rights in an amount greater than their reasonable needs within forty years.

B. Municipalities, counties, state universities, member-owned community water systems, special water users' associations and public utilities supplying water to municipalities or counties shall be allowed a water use planning period not to exceed forty years, and water rights for municipalities, counties, state universities, member-owned community water systems, special water users' associations and public utilities supplying water to such municipalities or counties shall be based upon a water development plan the implementation of which shall not exceed a forty-year period from the date of the application for an appropriation or a change of place or purpose of use pursuant to a water development plan or for preservation of a municipal, county, member-owned community water system or state university water supply for reasonably projected additional needs within forty years.

History

History: 1978 Comp., § 72-1-9, enacted by Laws 1985, ch. 198, § 1; 1990, ch. 40, § 1; 1999, ch. 40, § 3; 2000, ch. 73, § 2; 2003, ch. 369, § 1.

C.3.1 Water Right Permitting Process

The water right permitting process includes the following steps:

To obtain a new water right, the applicant must submit the application form to the OSE.

The OSE must then determine whether unappropriated water is available, whether the appropriation would be consistent with public welfare and conservation, and whether it would impair existing water rights.

The OSE also publishes the filing of the application in order to provide public notice so that individuals who believe their rights would be impaired by the approval of the permit are provided the opportunity to submit a protest to the application.

If no protest is submitted and the OSE determines that the water exists and that appropriation of it would not adversely impact public welfare and conservation, the OSE approves the water right application.

If settlement is not reached, then the application proceeds to an administrative hearing with the Hearings Unit of the OSE.

In the case of a protest, the OSE Hearings Unit must evaluate whether the applied-for water right would impair an existing water right(s). Through the examination of the

specific conditions of the application and the protestants, the OSE makes a determination, and the application is either granted or denied.

If a water right is granted, the OSE may place specific conditions in the permit to protect surrounding water rights holders Examples of conditions placed on permit holders may include monitoring or metering requirements, restricting use to certain months of the year, or disallowing use under specific conditions (low flow, for example).

C.3.2 Other Types of Water Rights

Many water rights have been established outside the permitting process in two different ways, as discussed in the following subsections.

C.3.2.1 Prebasin Wells

Since many of the underground water basins were declared after water rights holders had drilled wells and put that water to beneficial use, the Water Code recognizes these rights as valid.

72-12-4. [Existing water rights recognized.] (1931)Statute text

Existing water rights based upon application to beneficial use are hereby recognized. Nothing herein contained is intended to impair the same or to disturb the priorities thereof.

History

History: Laws 1931, ch. 131, § 4; 1941 Comp., § 77-1104; 1953 Comp., § 75-11-4.

C.3.2.2 Domestic and Livestock Watering Wells

As in many other western states, each New Mexico homeowner with a private well is allowed to use up to 3 acre-feet per year (af/yr) of groundwater (NMSA 71-12-1). Although a homeowner must file a document indicating that they will use the water, these “applications” are granted automatically and are neither published nor subject to protest (NMSA 72-12-1). The OSE does not allow a change in place of these domestic well uses; that is, it does not allow moving the right to another location. In that sense, the domestic well is a right of use only and is not intended to be sold separately from that intended location and purpose of use. However, nonpermitted prebasin domestic wells (Section D.3.2.1) are not subject to this limitation and may therefore be transferred.

C.3.3 Water Rights Transactions

Water rights transactions include transfers to other users, through sales or leases, and changes in point of diversion or in purpose or place of use. These transactions must follow an administrative procedure similar to the one used for appropriating a new water right. An application is filed, and notice is published with a certain time limit within which a protest must be submitted. The standard for reviewing these applications is impairment, public welfare, and conservation.

19.27.1.23 NMAC RETENTION OF OLD WELL FOR DOMESTIC USE – REQUIREMENTS

If water rights have been transferred from a well but the owner thereof desires to retain the well for the purposes of Article 1-15 [now 19.27.1.22 NMAC], an application must be filed as required by that article. Prior to approval, the state engineer shall determine whether the subject well can be retained in use without causing waste.

[SE-66-1 Article 1-16, Recompiled 12/31/01]

19.27.1.24 NMAC CHANGE OF WELL LOCATION AND PLACE AND/OR PURPOSE OF USE; SUPPLEMENTAL WELLS; EXTENSIONS OF TIME; PREREQUISITES FOR DRILLING; DEEPENING AND REPAIRING

A. Change of location of well: The owner of a water right within a declared underground water basin cannot change the location of his well without the approval of the state engineer except as otherwise provided in Section 75-11-23 [72-12-23 NMSA 1978].

B. Replacement well within one hundred feet of original well: The owner of a water right may drill and use a replacement well within one hundred (100) feet of the original well prior to application, publication, and hearing, if:

(1) The well is drilled in the same, and only the same, underground source; and

(2) The appropriation is of the same amount of water allowed by his water right in the original well; and

(3) An emergency situation exists which would result in serious economic loss if application, publication and hearing were required; and

(4) The owner notifies the state engineer office of these facts and of the location of the proposed well by registered letter prior to drilling; provided he files application for a permit within thirty (30) days after drilling begins.

(5) The owners of other water rights claiming injury by the drilling of a replacement well under these circumstances may not enjoin the drilling of such well or the use of the water from the well but are limited to an action at law to recover damages and to their right to protest the granting of a permit.

C. Replacement well over one hundred feet from original well: The owner of a water right may drill and use a replacement well over one hundred (100) feet from his original well upon making application without waiting for the completion of publication and hearing, if:

(1) The well is drilled in the same and only the same underground source; and

(2) The appropriation is of the same amount of water allowed by his water right in the original well; and

(3) An emergency situation exists which would result in serious economic loss if publication and hearing were required; and

(4) The state engineer after preliminary investigation finds that the change does not impair existing water rights and grants him a permit authorizing the drilling and use of the replacement well prior to publication and hearing;

(5) When preliminary investigation by the state engineer causes him to reasonably believe that the drilling and use of a replacement well may impair existing rights then no permit shall be issued until after publication and hearing.

[SE-66-1 Article 2-1, Recompiled 12/31/01]

19.27.1.25 NMAC CHANGE OF PLACE AND/OR PURPOSE OF USE

The owner of a water right within a declared underground water basin cannot change the place or purpose of use of the right without the approval of the state engineer. Such approval will be granted only after proper application is made and the state engineer determines that the proposed move would not impair existing water rights.

[SE-66-1 Article 2-2, Recompiled 12/31/01]

C.3.4 Loss of Water Rights

The Water Code specifies that nonuse for a period of four consecutive years when water is available may lead to forfeiture of the water right. Prior to 1965, water rights were automatically forfeited for a four-year period of nonuse. Legislation passed in 1965 requires the OSE to notify a water rights holder that the right is subject to forfeiture. After the OSE has provided notice, the water user has one year to put the water to beneficial use; however, if the nonuse continues after the OSE has provided notice, the water right is forfeited (NMSA 72-12-8). The forfeiture provision of the statute contains a few exceptions. Of particular interest to the regional water planning community is the exemption for placing water in "state engineer approved water conservation plans" (NMSA 72-12-8(D) and (E)). This provision applies to conservancy and irrigation districts, acequia and community ditch associations, municipalities, counties, water user associations, and state universities.

Water rights may also be lost through abandonment. Abandonment requires an intent to abandon in addition to discontinued use by the owner of the water, whereas forfeiture does not require an intent to relinquish the right (*State ex. rel. Reynolds v. South Springs Col.,* 80 N.M. 144 (146-47)). An example of abandonment would be to develop land formerly used for irrigation into a building, parking lot, or housing complex, thus clearly demonstrating that the owner of the land no longer intends to put their irrigation water right to use.

C.4 Setting Aside Water for Future Use

Through various provisions in the Water Code, the New Mexico legislature has created a mechanism to allow certain organizations to set aside water for use in the future. Although this notion is contrary to the well known "use it or lose it" concept at the heart of the prior appropriation system, it is essential for long-term water planning. The entities that have acquired special status for water planning under the code are "municipalities, counties, state universities, member-owned community water systems, municipal water users' associations and public utilities supplying water to municipalities or counties . . . which shall be allowed a water use planning period not to exceed 40 years, and water rights for these entities shall be based upon a water development plan the implementation of which shall not exceed the forty-year period" (NMSA 72-1-9 Cum Supp. 2000). This provision of the statute will allow entities in the Quay County area to legally appropriate and preserve water that they cannot currently use, but will need to meet projected water requirements for the region.

These organizations are exempt from forfeiture of unused water rights if those rights have been appropriated for the implementation of a water development plan or for preservation of water supplies (NMSA 72-12-8 (H)). These provisions are the same for both surface water and groundwater (NMSA 72-5-28). Conservancy districts also have special provisions that allow them to manage water without application of the forfeiture provisions. NMSA 72-5-28 (G) allows "periods of non use when water rights are acquired and placed in a state engineer approved water conservation program by a conservancy district organized under 73 -14-19."

C.5 Conjunctive Use

Conjunctive use is the legal and administrative recognition that a hydrologic connection exists between surface water and groundwater. Because of this recognition, New Mexico water law has evolved to incorporate a system whereby the OSE can manage groundwater and surface water in conjunction. From a water resources management perspective, the authority to manage these resources conjunctively has great benefit.

The OSE incorporated the concept of conjunctive management by requiring applicants for groundwater in stream-related basins to purchase surface water rights in an amount equivalent

to the proposed application in order to offset the impacts the groundwater pumping would have on the river. The OSE has subsequently integrated this policy into its groundwater regulations, which state that “applications to appropriate water will not be granted in declared underground water basins that are stream related, if the State Engineer finds that the appropriation will take 0.1 acre-feet or more from a fully appropriated stream within the year the permit may be exercised” (N.M.A.C. 1-15.6.4).

C.5 Canadian River Compact

CANADIAN RIVER COMPACT

The state of New Mexico, the state of Texas, and the state of Oklahoma, acting through their commissioners, John H. Bliss, for the state of New Mexico, E. V. Spence for the state of Texas, and Clarence Burch for the state of Oklahoma, after negotiations participated in by Berkeley Johnson, appointed by the president as the representative of the United States of America, have agreed respecting Canadian river as follows:

ARTICLE I

The major purposes of this compact [this section] are to promote interstate comity; to remove causes of present and future controversy; to make secure and protect present developments within the states; and to provide for the construction of additional works for the conservation of the waters of Canadian river.

ARTICLE II

As used in this compact:

(a) the term "Canadian river" means the tributary of Arkansas river which rises in northeastern New Mexico and flows in an easterly direction through New Mexico, Texas and Oklahoma and includes North Canadian river and all other tributaries of said Canadian river;

(b) the term "North Canadian river" means that major tributary of Canadian river officially known as North Canadian river from its source to its junction with Canadian river and includes all tributaries of North Canadian river;

(c) the term "commission" means the agency created by this compact for the administration thereof;

(d) the term "conservation storage" means that portion of the capacity of reservoirs available for the storage of water for subsequent release for domestic, municipal, irrigation and industrial uses, or any of them, and it excludes any portion of the capacity of reservoirs allocated solely to flood control, power production and sediment control, or any of them.

ARTICLE III

All rights to any of the waters of Canadian river which have been perfected by beneficial use are hereby recognized and affirmed.

ARTICLE IV

(a) New Mexico shall have free and unrestricted use of all waters originating in the drainage basin of Canadian river above Conchas dam.

(b) New Mexico shall have free and unrestricted use of all waters originating in the drainage basin of Canadian river in New Mexico below Conchas dam, provided that the amount of conservation storage in New Mexico available for impounding these waters which originate in the drainage basin of Canadian river below Conchas dam shall be limited to an aggregate of 200,000 acre- feet.

(c) The right of New Mexico to provide conservation storage in the drainage basin of North Canadian river shall be limited to the storage of such water as at the time may be unappropriated under the laws of New Mexico and of Oklahoma.

ARTICLE V

Texas shall have free and unrestricted use of all waters of Canadian river in Texas, subject to the limitations upon storage of water set forth below:

(a) the right of Texas to impound any of the waters of North Canadian river shall be limited to storage on tributaries of said river in Texas for municipal uses, for household and domestic uses, livestock watering, and the irrigation of lands which are cultivated solely for the purpose of providing food and feed for the householders and domestic livestock actually living or kept on the property;

(b) until more than 300,000 acre- feet of conservation storage shall be provided in Oklahoma, exclusive of reservoirs in the drainage basin of North Canadian river and exclusive of reservoirs in the drainage basin of Canadian river east of the 97th meridian, the right of Texas to retain water in conservation storage, exclusive of waters of North Canadian river, shall be limited to 500,000 acre-feet; thereafter the right of Texas to impound and retain such waters in storage shall be limited to an aggregate quantity equal to 200,000 acre- feet plus whatever amount of water shall be at the same time in conservation storage in reservoirs in the drainage basin of Canadian river in Oklahoma, exclusive of reservoirs in the drainage basin of North Canadian river and exclusive of reservoirs east of the 97th meridian; and for the purpose of determining the amount of water in conservation storage, the maximum quantity of water in storage following each flood or series of floods shall be used; provided, that the right of Texas to retain and use any quantity of water previously impounded shall not be reduced by any subsequent application of the provisions of this Paragraph (b);

(c) should Texas for any reason impound any amount of water greater than the aggregate quantity specified in Paragraph (b) of this article, such excess shall be retained in storage until under the provisions of said paragraph Texas shall become entitled to its use; provided, that, in event of spill from conservation storage, any such excess shall be reduced by the amount of such spill from the most easterly reservoir on Canadian river in Texas; provided further, that all such excess quantities in storage shall be reduced monthly to compensate for reservoir losses in proportion to the total amount of water in the reservoir or reservoirs in which such h excess water is being held; and provided further that on demand by the commissioner for Oklahoma the remainder of any such excess quantity of water in storage shall be released into the channel of Canadian river at the greatest rate practicable.

ARTICLE VI

Oklahoma shall have free and unrestricted use of all waters of Canadian river in Oklahoma.

ARTICLE VII

The commission may permit New Mexico to impound more water than the amount set forth in Article IV and may permit Texas to impound more water than the amount set forth in Article V; provided, that no state shall thereby be deprived of water needed for beneficial use; provided further that each such permission shall be for a limited period not exceeding twelve months; and provided further that no state or user of water within any state shall thereby acquire any right to the continued use of any such quantity of water so permitted to be impounded.

ARTICLE VIII

Each state shall furnish to the commission at intervals designated by the commission accurate records of the quantities of water stored in reservoirs pertinent to the administration of this compact [this section].

ARTICLE IX

(a) There is hereby created an interstate administrative agency to be known as the "Canadian river commission." The commission shall be composed of three commissioners, one from each of the signatory states, designated or appointed in accordance with the laws of each such state, and if designated by the president an additional commissioner representing the United States. The president is hereby requested to designate such a commissioner. If so designated, the commissioner representing the United States shall be the presiding officer of the commission, but shall not have the right to vote in any of the deliberations of the commission. All members of the commission must be present to constitute a quorum. A unanimous vote of the commissioners for the three signatory states shall be necessary to all actions taken by the commission.

(b) The salaries and personal expenses of each commissioner shall be paid by the government which he represents. All other expenses which are incurred by the commission incident to the administration of this compact and which are not paid by the United States shall be borne equally by the three states and be paid by the commission out of a revolving fund hereby created to be known as the "Canadian river revolving fund." Such fund shall be initiated and maintained by equal payments of each state into the fund in such amounts as will be necessary for administration of this compact. Disbursements shall be made from said fund in such manner as may be authorized by the commission. Said fund shall not be subject to the audit and accounting procedures of the states. However, all receipts and disbursements of funds handled by the commission shall be audited by a qualified independent public accountant at regular intervals and the report of the audit shall be included in and become a part of the annual report of the commission.

(c) The commission may:

(1) employ such engineering, legal, clerical and other personnel as in its Judgement may be necessary for the performance of its functions under this compact;

(2) enter into contracts with appropriate federal agencies for the collection, correlation and presentation of factual data, for the maintenance of records, and for the preparation of reports;

(3) perform all functions required of it by this compact and do all things necessary, proper or convenient in the performance of its duties hereunder, independently or in cooperation with appropriate governmental agencies.

(d) The commission shall:

(1) cause to be established, maintained and operated such stream and other gaging stations and evaporation stations as may from time to time be necessary for proper administration of the compact, independently or in cooperation with appropriate governmental agencies;

(2) make and transmit to the governors of the signatory states on or before the last day of March of each year, a report covering the activities of the commission for the preceding year;

(3) make available to the governor of any signatory state, on his request, any information

within its possession at any time, and shall always provide access to its records by the governors of the states, or their representatives, or by authorized representatives of the United States.

ARTICLE X

(a) affecting the obligations of the United States to the Indian tribes;

(b) subjecting any property of the United States, its agencies or instrumentalities, to taxation by any state or subdivision thereof, or creating any obligation on the part of the United States, its agencies or instrumentalities, by reason of the acquisition, construction or operation of any property or works of whatever kind, to make any payment to any state or political subdivision thereof, state agency, municipality or entity whatsoever, in reimbursement for the loss of taxes;

(c) subjecting any property of the United States, its agencies or instrumentalities, to the laws of any state to an extent other than the extent to which such laws would apply without regard to this compact;

(d) applying to, or interfering with, the right or power of any signatory state to regulate within its boundaries the appropriation, use and control of water, not inconsistent with its obligations under this compact;

(e) establishing any general principle or precedent applicable to other interstate streams.

ARTICLE XI

This compact shall become binding and obligatory when it shall have been ratified by the legislature of each state and approved by the congress of the United States. Notice of ratification by the legislature of each state shall be given by the governor of that state to the governors of the other states and to the president of the United States. The president is hereby requested to give notice to the governor of each state of approval by the congress of the United States. In witness whereof, the commissioners have executed four counterparts hereof, each of which shall be and constitute an original, one of which shall be deposited in the archives of the department of state of the United States, and one of which shall be forwarded to the governor of each state. Done at the city of Santa Fe, state of New Mexico, this 6th day of December, 1950.

/s/ JOHN H. BLISS

John H. Bliss

Commissioner for the state of New Mexico

/s/ E. V. SPENCE

E. V. Spence

Commissioner for the state of Texas

/s/ CLARENCE BURCH

Clarence Burch

Commissioner for the state of Oklahoma

APPROVED:

/s/ BERKELEY JOHNSON

Berkeley Johnson

Representative of the United States of America

_____

The state of New Mexico ratified, approved and adopted the compact in 1951 (1978 Comp., § 72-15-2, enacted by Laws 1951, ch. 4, § 1.)

C.6 Stipulated Judgement, STATE OF OKLAHOMA and STATE OF TEXAS *v.* NEW MEXICO

SUPREME COURT OF THE UNITED STATES

STATE OF OKLAHOMA and STATE OF TEXAS *v.* NEW MEXICO

on joint motion for entry of stipulated Judgement and decree

No. 109, Original. Decided December 13, 1993

The joint motion for entry of stipulated Judgement and decree, as modified, is granted.

STIPULATED JUDGEMENT, AS MODIFIED

1. New Mexico has been in violation of Article IV(b) of the Canadian River Compact from 1987 to date.

2. Pursuant to Paragraph 8 of the Decree entered in this case, New Mexico shall release from Ute Reservoir in 1993 sufficient water to result in an aggregate of not more than 200,000 acre feet of conservation storage below Conchas Dam in New Mexico, including conservation storage in the other reservoirs subject to the limitation under Article IV(b) of the Canadian River Compact. The release of water from Ute Reservoir will be coordinated with Oklahoma and Texas and will be at the call of Texas.

3. New Mexico shall also release from Ute Reservoir an additional 25,000 acre feet of storage below the Article IV(b) limitation. New Mexico shall operate Ute Reservoir through the year 2002 at or below the elevations set forth in the schedule below and in accordance with the provisions of Paragraph 8 of the Decree entered in this case. The schedule includes annual adjustments for sediment accumulation in Ute Reservoir and assumes the other reservoirs subject to the Article IV(b) limitation maintain storage at their total capacity of 6,760 acre feet. The schedule shall be adjusted by the parties to reflect additional amounts of water in conservation storage in any reservoir enlarged or constructed after 1992. Releases of water from Ute Reservoir will be coordinated with Oklahoma and Texas and will be at the call of Texas.

Ute Reservoir Operating Schedule

Reduced Corresponding

Authorized Storage Reduced

Year	Elevation	Amount	Elevation
After release in 1993	3781.58	25,000	3778.86
1994	3781.66	25,000	3778.95
1995	3781.74	25,000	3778.04
1996	3781.83	25,000	3778.14
1997	3781.91	25,000	3778.23
1998	3781.99	20,000	3779.08
1999	3782.08	15,000	3779.91
2000	3782.16	6,250	3781.28
2001	3782.24	3,125	3781.80
Refilled in 2002	3782.32	0	3782.32

4. Within seventy five (75) days after entry of Judgement New Mexico shall pay as attorneys' fees $200,000 to Texas and $200,000 to Oklahoma. The parties agree that such payments do not constitute and shall not be considered as an admission, express or implicit, that New Mexico has any liability to Texas or Oklahoma for attorneys' fees.

5. Oklahoma and Texas shall release New Mexico from all claims for equitable or legal relief, other than the relief embodied in the Decree of the parties, arising out of New Mexico's violation of the Canadian River Compact during the years 1987 through the date this Stipulated Judgement is entered.

6. In the event of a conflict between this Judgement and the Decree entered in this case, the provisions of the Judgement shall control.

8. The costs of this case shall be equally divided among the parties.

DECREE, AS MODIFIED

1. Under Article IV(a) of the Canadian River Compact ("Compact"), New Mexico is permitted free and unrestricted use of the waters of the Canadian River and its tributaries in New Mexico above Conchas Dam, such use to be made above or at Conchas Dam, including diversions for use on the Tucumcari Project and the Bell Ranch and the on project storage of return flow or operational waste from those two projects so long as the recaptured water does not include the mainstream or tributary flows of the Canadian River; provided that transfers of water rights from above Conchas Dam to locations below Conchas Dam shall be subject to the conservation storage limitation of Compact Article IV(b). Nothing in this paragraph shall be deemed to determine whether or not the place of use of water rights may be transferred to locations outside the Canadian River basin in New Mexico.

2. Under Compact Article IV(b), New Mexico is limited to storage of no more than 200,000 acre feet of the waters of the Canadian River and its tributaries, regardless of point of origin, at any time in reservoirs in the Canadian River basin in New Mexico below Conchas Dam for any beneficial use, exclusive of water stored for the exempt purposes specified in Compact Article II(d) and on project storage of irrigation return flows or operational waste on the Tucumcari Project and Bell Ranch as provided for in Paragraph 1 of this Decree.

3. Quantities of water stored primarily for flood protection, power generation or sediment control are not chargeable as conservation storage under the Compact even though incidental use is made of such waters for recreation, fish and wildlife or other beneficial uses not expressly mentioned in the Compact. In situations where storage may be for multiple purposes, including both conservation storage and exempt storage, nothing in this Decree shall preclude the Canadian River Commission ("Commission") from exempting an appropriate portion of such storage from chargeability as conservation storage.

4. Water stored at elevations below a dam's lowest permanent outlet works is not chargeable as conservation storage under the Compact unless the primary use of that storage is for a non exempt purpose, or unless other means, such as pumps, are utilized to discharge such storage volumes from the reservoir. No change in the location of a dam's lowest permanent outlet works to a higher elevation shall provide the basis for a claim of exempt status for all water stored below the relocated outlet works without prior approval of the Commission, which shall not be unreasonably withheld. Water stored for non exempt purposes behind a dam with capacity in excess of 100 acre feet and with no outlet works is chargeable as conservation storage.

5. Future designation or redesignation of storage volumes for flood control, power production or sediment control purposes must receive prior Commission approval to be exempt from chargeability as conservation storage, which approval shall not be unreasonably withheld.

6. All water stored in Ute Reservoir above elevation 3725 feet is conservation storage; provided that at such time as the authorization and funding of the Eastern New Mexico Water Supply Project or other project results in changed circumstances at Ute Reservoir, New Mexico may seek exemption of a reasonable portion of such water from the Commission under Paragraph 5 of this Decree and, if an exemption is denied, may petition the Court for appropriate relief under Paragraph 11 of this Decree.

8. In 1988 there were 63 small reservoirs in New Mexico with capacities of 100 acre feet or less with a total capacity of about 1,000 acre feet, which the Commission has treated as de minimis by waiving storage volume reporting obligations. Water stored in these reservoirs or in similarly sized reservoirs in the future is not chargeable as conservation storage, unless otherwise determined by the Commission.

8. Based on the elevation capacity relationship of Ute Reservoir effective January 1, 1993, and adjustments pursuant to Paragraph 9 of this Decree, New Mexico shall make and maintain

appropriate releases of water from Ute Reservoir or other conservation storage facilities in excess of 100 acre feet of capacity at the maximum rate consistent with safe operation of such reservoirs so that total conservation storage in the Canadian River basin below Conchas Dam in New Mexico is limited to no more than 200,000 acre feet at any time; provided that operation of Ute Reservoir for the period 1993-2002 shall be pursuant to the schedule contained in the Judgement entered in this case; and provided that no violation of this paragraph will occur during any period in which the outlet works of Ute Reservoir are discharging water at the maximum safe discharge capacity (currently 350 cubic feet per second) following the first knowledge that the 1993-2002 schedule or the Article IV(b) limitation after 2002 probably would be exceeded; and provided further that Texas shall be notified by New Mexico prior to a release and may allow New Mexico to retain water in conservation storage in excess of the 1993-2002 schedule or the Article IV(b) limitation after 2002, subject to the call of Texas and subject to the provisions of Article V of the Compact. The outlet works of Ute Reservoir shall be maintained in good working order and shall not be modified to reduce the safe discharge capacity without prior approval of the Commission, which shall not be unreasonably withheld.

9. Sediment surveys of Ute Reservoir shall be conducted at least every ten years by New Mexico, unless such requirement is waived by the Commission. Conservation storage in Ute Reservoir shall be determined from the most recent sediment survey and an annual estimate of the total additional sediment deposition in the reservoir using an annual average of sediment accumulation during the period between 1963 and the most recently completed survey.

10. Nothing in this Decree is intended to affect a state's rights or obligations under the Compact, except as specifically addressed herein.

11. The Court retains jurisdiction of this suit for the purposes of any order, direction, or modification of this Decree, or any supplementary decree, that may at any time be deemed proper in relation to the subject matter in controversy; provided, that any party requesting the Court to exercise its jurisdiction under this paragraph or answering such request shall certify that it has attempted to negotiate in good faith with the other parties in an effort to resolve the dispute sought to be brought before the Court.

Appendix D

NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) POLICY FOR THE ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER

August 7, 2003

I. PURPOSE

This Policy describes requirements for minimum discharge standards for the above ground use of reclaimed domestic wastewater ("reclaimed wastewater") to ensure protection of public health and the environment. NMED has developed this Policy to promote the safe use of reclaimed wastewater to offset the use of limited potable water resources in the State. The Policy is intended to provide direction to NMED staff in review of Ground Water Discharge Permit applications which include the use of reclaimed wastewater in order to ensure consistency in the application review process and in the development of permit requirements to the fullest extent possible. The Policy will also be made available to the regulated community and their consultants to provide guidance for future facility planning. It is recommended that Ground Water Discharge Permits that include the discharge of reclaimed wastewater contain at a minimum the standards set forth in this Policy. NMED will review all permit applications objectively and with professional Judgement to establish whether they conform to applicable laws, regulations, and requirements. NMED encourages the development and implementation of new processes and equipment, and will favorably consider them with an appropriate demonstration of meeting the performance standards contained within this Policy.

The responsibility of meeting the standards set forth in this Policy shall be assigned to the generator of the reclaimed wastewater unless this responsibility is assumed by a separate entity pursuant to an approved Ground Water Discharge Permit. Implementation of the standards for existing dischargers will be determined on a individual facility basis at the time of permit renewal and/or modification.

Finally, the discharge of reclaimed wastewater may also be regulated by the United States Environmental Protection Agency (EPA) or the New Mexico Construction Industries Division (CID). Discharges to waters of the United States (including ephemeral streams and dry arroyos) require a National Pollutant Discharge Elimination System permit from EPA. The use of reclaimed wastewater for indoor plumbing (e.g., toilet flushing, fire suppression) requires approval from CID.

II. DEFINITIONS

Agronomic Rate: the rate of application of nutrients to plants that is necessary to satisfy the plants' nutritional requirements while strictly minimizing the amount of nutrients that run off to surface waters or which pass below the root zone of the plants.

Class 1A Reclaimed Wastewater: the highest quality reclaimed wastewater described in this Policy and can be most broadly utilized except for direct consumption. [approved uses listed in Table 1]

Class 1B Reclaimed Wastewater: the second highest quality reclaimed wastewater described in this Policy and is suitable for uses in which public exposure is likely. [approved uses listed in Table 1]

Class 2 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is restricted. [approved uses listed in Table 1]

Class 3 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is prohibited. [approved uses listed in Table 1]

Domestic wastewater: wastewater containing human excreta and water carried waste from typical residential plumbing fixtures and activities, including but not limited to wastes from toilets, sinks, bath fixtures, clothes or dishwashing machines and floor drains. Municipal and private wastewater treatment facilities receiving industrial waste must demonstrate adequate industrial waste pretreatment.

Dwelling unit: a structure which contains bedrooms.

Establishment: a structure used as a place of business, education, or assembly.

Flood Irrigation: land application of reclaimed wastewater by ditches, furrows, pipelines and other non-sprinkler methods.

Food Crops: any crop intended for human consumption.

Grab Sample: an individual sample collected in less than 15 minutes.

Major WWTP: any treatment plant with a maximum design capacity of 1,000,000 gallons or more per day.

Minor WWTP: any treatment plant with a maximum design capacity of less than 1,000,000 gallons per day.

Monthly Geometric Mean: value calculated by taking the sum of the logarithms (sum log x) of each of the data points from the previous calendar month, dividing the sum by the number of data points and then taking the anti-logarithm of the result (10y = anti-logarithm of 'y').

NTU: nephelometric turbidity units.

Occupied establishment: any establishment that is occupied at the time of irrigation.

Peak hourly flow: the highest hourly flow rate within a 24 hour period.

Reclaimed wastewater: domestic wastewater that has been treated to the standards required for the specific uses set forth in this policy and other applicable local, state, or federal regulations.

Spray Irrigation: land application of reclaimed wastewater by dispersing it in the air utilizing equipment which provides a low trajectory application and which minimizes misting of the reclaimed wastewater.

Surface Drip Irrigation: any method of land application of reclaimed wastewater through an array of emitters placed on or above the ground surface, each of which has a maximum discharge rate of 1.0 gallon per hour.

3-hour Composite Sample: three effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

6-hour Composite Sample: six effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

24-hour Composite Sample: twenty-four effluent portions collected no closer together than one hour and composited in proportion to flow.

30-day Average:

> *For fecal coliform bacteria*: the geometric mean of the values for all effluent samples collected during a calendar month.

For other than for fecal coliform bacteria: the arithmetic mean of the daily values for all effluent samples collected during a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

III. BACKGROUND

This Policy supersedes the New Mexico Environmental Improvement Division (NMEID) 1985 Policy for the Use of Domestic Wastewater Effluent for Irrigation. The Policy establishes specific quality standards, operational requirements, and approved uses for different categories of reclaimed wastewater (Class 1A, Class 1B, Class 2, and Class 3) dependent on public exposure. While the standards set forth is this Policy are deemed protective of public health and the environment, the policy does not prevent communities from adopting more stringent requirements.

IV. WASTEWATER TREATMENT PROCESS REQUIREMENTS

The quality standards for Class 1B, Class 2, and Class 3 assume a minimum of conventional secondary wastewater treatment plus disinfection. Class 1A assumes treatment to remove colloidal organic matter, color and other substances that interfere with disinfection, thereby allowing for the use of the reclaimed wastewater for urban landscaping adjacent to dwelling units or occupied establishments.

V. GENERAL ABOVE GROUND USE PERMIT REQUIREMENTS

A. ALL APPROVED USES

1. Whenever reclaimed wastewater is used for any use approved in this Policy, the wastewater shall meet the minimum standards set forth in this Policy.

2. Whenever reclaimed wastewater other than Class 1A is used in areas with public access it shall be applied at times and in a manner that minimizes public contact.

3. Whenever reclaimed wastewater is used in areas with restricted public access, the public shall be excluded from entering the area.

4. Reclaimed wastewater shall only be used for soil compaction or dust control in construction areas where application procedures minimize aerosol drift to public areas.

5. Reclaimed wastewater quality standards shall be measured at the discharge point of the wastewater treatment plant.

6. Signs (in English and Spanish) shall be placed at the entrance to areas receiving reclaimed wastewater, and other locations where public access may occur stating:

"**NOTICE – THIS AREA IS IRRIGATED WITH RECLAIMED WASTEWATER – DO NOT DRINK**"; "**AVISO – ESTA ÁREA ESTÁ REGADA CON AGUAS NEGRAS RECOBRADAS – NO TOMAR**"

7. All piping, valves and outlets, shall be color-coded in purple pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code to differentiate piping or fixtures used to convey reclaimed wastewater from piping or fixtures used for potable or other water. All valves, outlets, and sprinkler heads used in reclaimed wastewater systems should be of a type that can only be operated by authorized personnel. Those portions of reclaimed wastewater systems that are underground and were installed prior to the adoption of this Policy are exempt from the purple color-coding requirement if all accessible portions of the reclaimed wastewater system are colored purple or clearly labeled as being part of a reclaimed wastewater distribution system.

8. Reclaimed wastewater systems shall have no direct or indirect cross connections with potable water systems pursuant to the latest revision of the New Mexico Plumbing and

Mechanical Code. For reclaimed wastewater systems that were installed prior to the adoption of this Policy, the absence of cross connections may be demonstrated via hydrostatic testing or as-built drawings, supported by an affidavit under oath that no cross connection exists.

9. Above ground use of reclaimed wastewater shall not result in excessive standing or pooling of wastewater, and shall be applied at the appropriate agronomic rate. Irrigation shall not be conducted at times when the receiving area is saturated or frozen.

10. The discharge of reclaimed wastewater shall be confined to the area designated and approved for receiving the wastewater. Irrigation shall be postponed at times when windy conditions may result in drift of reclaimed wastewater outside the designated area of application.

11. Treatment facilities which provide reclaimed wastewater to parks, golf courses, schools and other areas where human exposure is likely, must have an emergency storage pond or alternate disposal method where reclaimed wastewater can be diverted during periods when conditions are unfavorable for approved uses or when the quality standards defined in this Policy cannot be met.

B. IRRIGATION OF FOOD CROPS

1. Reclaimed wastewater shall not be used for the spray irrigation of food crops.
2. Reclaimed wastewater shall not be used for surface irrigation of food crops except where there is no contact between the edible portion of the crop and the wastewater, and the wastewater shall have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2).

C. IRRIGATION OF FODDER, FIBER AND SEED CROPS

1. Reclaimed wastewater used for the irrigation of pasture to which milking cows or goats have access shall have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2).
2. Except pasture for milk-producing animals, reclaimed wastewater used for the irrigation of fodder, fiber and seed crops shall have a level of quality no less than Class 3 Reclaimed Wastewater (Table 2).

D. IRRIGATION OF LANDSCAPES

1. Reclaimed wastewater used for irrigation shall be applied such that direct and windblown spray is confined to the area designated and approved for application.
2. Reclaimed wastewater used for the irrigation of freeway landscapes and landscapes in other areas where the public has similarly limited access or exposure shall have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2). Public access to the irrigation site must be restricted during the period of application.
3. Reclaimed wastewater used for the irrigation of parks, playgrounds, schoolyards, golf courses, cemeteries and other areas where the public has similarly open access or exposure shall have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2), and the irrigation system must have low trajectory spray nozzles. *Areas which are spray irrigated and located within 100 feet of a dwelling unit or occupied establishment shall only receive Class 1A Reclaimed Wastewater* (Tables 2 & 3).

VI. SPECIFIC ABOVE GROUND USE REQUIREMENTS

A. CLASSIFICATION AND USES OF RECLAIMED WASTEWATER

This Policy establishes four classes of reclaimed wastewater (Class 1A, Class 1B, Class 2, and Class 3) based on the quality of the wastewater following treatment and disinfection, and dependent on the likelihood of public exposure. Class 1A reclaimed wastewater may be used for any purpose except direct consumption, food handling and processing, and spray irrigation of food crops. Class 1B reclaimed wastewater may be used where public exposure is likely, and where the appropriate setback requirements are met (Table 3). Class 2 and Class 3 reclaimed wastewater may be used where public access is restricted with correspondingly less stringent requirements for treatment and disinfection.

Table1 presents the approved uses for Classes 1A, 1B, 2, and 3 reclaimed wastewater. Any reclaimed wastewater treated to higher quality than the lower classes may be used for the purposes established for the lower classes. *Other uses of reclaimed wastewater not included in Table 1 must be evaluated on a case by case basis by NMED for review and approval.*

Table 1. Approved Uses for Reclaimed Wastewater by Class

Class of Reclaimed Wastewater	Approved Uses
Class 1A	All Class 1 uses. *No setback limit* to dwelling unit or occupied establishment.
	Backfill around potable water pipes
	Irrigation of food crops[1]
Class 1B	Impoundments (recreational or ornamental)
	Irrigation of parks, school yards, golf courses[2]
	Irrigation of urban landscaping[2]
	Snow making
	Street cleaning
	Toilet flushing
	Backfill around non-potable piping
Class 2	Concrete mixing
	Dust control
	Irrigation of fodder, fiber, and seed crops for milk-producing animals
	Irrigation of roadway median landscapes
	Irrigation of sod farms
	Livestock watering

Table 1. Approved Uses for Reclaimed Wastewater by Class	
Class of Reclaimed Wastewater	**Approved Uses**
	Soil compaction
Class 3	Irrigation of fodder, fiber, and seed crops for non-milk-producing animals
	Irrigation of forest trees (silviculture)

[1] Irrigation of food crops shall only be allowed for food crops when there is no contact between the edible portion of the crop and the wastewater. Spray irrigation is prohibited for food crops.

[2] If reclaimed wastewater is applied using spray irrigation, the setback limitation of Table 3 "Spray Irrigation" is required.

B. WASTEWATER QUALITY STANDARDS AND MONITORING REQUIREMENTS

This section establishes minimum wastewater quality standards and monitoring frequencies for Classes 1A, 1B, 2, and 3 of reclaimed wastewater. The frequency of wastewater quality monitoring is patterned after EPA requirements for discharges of treated and disinfected wastewater to surface waters. The monitoring requirements are dependent on the quality of reclaimed wastewater produced at the treatment plant and the design capacity of the treatment plant. For example, a "major" wastewater treatment plant (having a maximum design capacity of 1 million gallons or more per day) producing Class 1A Reclaimed Wastewater has the most stringent monitoring requirements. The wastewater quality standards and monitoring frequencies for Classes 1A, 1B, 2, and 3 of reclaimed wastewater are presented below in Table 2. In the event that a facility proposes alternate wastewater quality standards and/or monitoring frequencies, it is the responsibility of the facility owner/operator to demonstrate that the proposed alternate provides equal assurance of the protection of public health and ground water as the minimum standards.

Reclaimed wastewater generated from communities with significant commercial and/or industrial wastewater generators may be subject to more extensive contaminant screening and monitoring requirements.

Table 2. Wastewater Quality Standards and Monitoring Frequencies by Class of Reclaimed Wastewater. Class of Reclaimed Wastewater Wastewater Quality Parameter Wastewater Quality Standards Wastewater Monitoring Requirements 30-Day Average Maximum Sample Type Measurement Frequency Class 1A BOD5 10 mg/l 15 mg/l 6-hour composite[5] 3 tests per week for major

Table 2. Wastewater Quality Standards and Monitoring Frequencies by Class of Reclaimed Wastewater.

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Standards		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 1A	BOD_5	10 mg/l	15 mg/l	6-hour composite[5]	3 tests per week for major WWTP[1]; 1 test per 2 weeks for minor WWTP
	Turbidity	3 NTU	5 NTU	Continuous	Continuous
	Fecal Coliform[2]	5 per 100 ml[3]	23 per 100 ml[4]	Grab sample at peak flow	3 tests per week for major WWTP; 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow
Class 1B	BOD_5	30 mg/l	45 mg/l	6-hour composite[5]	3 tests per week for major WWTP[1]; 1 test per 2 weeks for minor WWTP
	TSS	30 mg/l	45 mg/l	6-hour composite	3 tests per week for major WWTP[1]; 1 test per 2 weeks for minor WWTP
	Fecal Coliform[2]	100 organisms per 100 ml[3]	200 organisms per 100 ml[4]	Grab sample at peak flow	3 tests per week for major WWTP; 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow
Class 2	BOD_5	30 mg/l	45 mg/l	6-hour composite for major WWTP[5]; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	TSS	30 mg/l	45 mg/l	6-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP

Table 2. Wastewater Quality Standards and Monitoring Frequencies by Class of Reclaimed Wastewater.

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Standards		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 2 continued	Fecal Coliform[2]	200 organisms per 100 ml[3]	400 organisms per 100 ml[4]	Grab sample at peak hourly flow	1 test per week for major WWTP; 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow
Class 3	BOD_5	30 mg/l	45 mg/l	3-hour composite for major WWTP[5]; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	TSS	75 mg/l	90 mg/l	3-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	Fecal Coliform[2]	1,000 organisms per 100 ml[3]	5,000 organisms per 100 ml[4]	Grab sample at peak hourly flow	1 test per week for major WWTP; 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow

[1] The composite samples must be taken on separate days.

[2] The E. coli organism may alternately be tested once equivalent concentrations are determined.

[3] Measured as the monthly geometric mean.

[4] Single sample maximum value.

[5] 24-hour composite sampling may used in lieu of 3 or 6-hour composite sampling requirements.

C. ACCESS RESTRICTIONS AND SET-BACK REQUIREMENTS

Table 3 presents the minimum standards for access controls and setback distances necessary to minimize direct and indirect public exposure to reclaimed wastewater. Setback distances required in this Policy are in all cases the distance from the edge of any area receiving reclaimed wastewater to well casings, dwelling unit, or occupied establishment.

In addition to the setback requirements described in Table 3, all water supply wells within 200 feet of a wetted irrigation area must be evaluated for adequate well head construction and irrigation practices to ensure protection of ground water. NMED may impose setback requirements as needed to make certain that the application of reclaimed wastewater does not threaten ground water resources.

Table 3. Access Restrictions and Set Back Requirements

Class of Reclaimed Wastewater	Spray Irrigation	Flood Irrigation and Surface Drip Irrigation
Class 1A	• No access control • No setback to dwelling unit or occupied establishment	• No access control
Class 1B	• No access control; irrigate at times when public exposure is unlikely • 100 ft set-back from dwelling unit or occupied establishment	• No access control; irrigate at times when public exposure is unlikely
Class 2	• Access restricted by perimeter fencing using 4- strand barbed wire and locking gate or other NMED approved access controls• 100 ft set-back from dwelling unit or occupied establishment	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate, or other NMED approved access controls
Class 3	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate • 500 ft set-back from dwelling unit or occupied establishment • Low pressure/low trajectory irrigation system only	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate • 100 ft set-back to dwelling unit or occupied establishment.

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Ron Curry, Secretary Date
Environment Department

Appendix E

United States EPA Drinking Water Standards

EPA sets standards that, when combined with protecting ground water and surface water, are critical to ensuring safe drinking water. EPA works with its regional offices, states, tribes and its many partners to protect public health through implementing the Safe Drinking Water Act.

List of Contaminants & their MCLs

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Acrylamide	TT8	Nervous system or blood problems;	Added to water during sewage/wastewater increased risk of cancer treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl2)	MRDL=4.01	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG =41
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl2)	MRDL=4.01	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG =41
D	Chlorine dioxide (as ClO2)	MRDL=0.81	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	MRDLG =0.81
DBP	Chlorite	1	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
IOC	Copper	TT7; Action Level = 1.3	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage.	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	Cryptosporidium	TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, live problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT8	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidneys problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	*Giardia lamblia*	TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a6
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT3	HPC has no health effects;	HPC measures a range of bacteria that are naturally present in the environment	n/a
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT7; Action Level = 0.015	Infants and children: Delays in physical or mental development; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	*Legionella*	TT3	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms (including fecal coliform and *E. coli*)	5.0%	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present5	Coliforms are naturally present in the environment as well as feces; fecal coliforms and *E. coli*only come from human and animal fecal waste.	zero
DBP	Total Trihalomethanes (TTHMs)	0.10 0.080 after 12/31/03	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a6
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero
M	Turbidity	TT3	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness	Soil runoff	n/a
R	Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero
OC	Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero

	Contaminant	MCL or TT1 (mg/L)2	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
M	Viruses (enteric)	TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

D	**Dinsinfectant**	**IOC**	**Inorganic Chemical**
OC	**Organic Chemical**	**DBP**	**Disinfection Byproduct**
M	**Microorganism**	**R**	**Radionuclides**

Definitions

• Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

• Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

• Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below whic there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

• Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants

• Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards. Table 5-13 shows the National Secondary Drinking Water Standards.

Contaminant	Secondary Standard
Aluminum	**0.05 to 0.2 mg/L**
Chloride	**250 mg/L**
Color	**15 (color units)**
Copper	**1.0 mg/L**
Corrosivity	**noncorrosive**
Fluoride	**2.0 mg/L**
Foaming Agents	**0.5 mg/L**
Iron	**0.3 mg/L**
Manganese	**0.05 mg/L**
Odor	**3 threshold odor number**
pH	**6.5-8.5**
Silver	**0.10 mg/L**
Sulfate	**250 mg/L**
Total Dissolved Solids	**500 mg/L**
Zinc	**5 mg/L**

Appendix F

Water Conservation Ordinances and SB554

SB 554

AN ACT RELATING TO WATER; REQUIRING MUNICIPALITIES, COUNTIES AND OTHER COVERED ENTITIES TO ADOPT WATER CONSERVATION AND DROUGHT MANAGEMENT PLANS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF NEW MEXICO:

Section 1. A new section of Chapter 3, Article 17 NMSA 1978 is enacted to read: "WATER CONSERVATION AND DROUGHT MANAGEMENT PLANS.— A municipality shall consider ordinances and codes to encourage water conservation and drought management planning pursuant to the provisions of Section 3 of this act."

Section 2. A new section of Chapter 4 NMSA 1978 is enacted to read: "WATER CONSERVATION AND DROUGHT MANAGEMENT PLANS.— A county shall consider ordinances and codes to encourage water conservation and drought management planning pursuant to the provisions of Section 3 of this act."

Section 3. A new section of Chapter 72, Article 14 NMSA 1978 is enacted to read: "WATER CONSERVATION PLANS--MUNICIPALITIES, COUNTIES AND WATER SUPPLIERS.-

A. As used in this section, "covered entity" means municipalities, counties and any other person that supplies, distributes or otherwise provides at least five hundred acre-feet of water annually for domestic, commercial, industrial or government customers for other than agricultural purposes, but does not include Indian tribes, pueblos, nations, chapters or any entity of a tribe, pueblo, nation or chapter.

B. A covered entity may develop, adopt and submit to the state engineer by December 31, 2005 a comprehensive water conservation plan, including a drought management plan.

C. The manner in which the covered entity develops, adopts and implements a comprehensive water conservation plan shall be determined by the covered entity. The plan shall be accompanied by a program for its implementation.

D. In developing a water conservation plan pursuant to this section:

(1) municipalities and counties shall consider ordinances and codes to encourage conservation measures; covered entities without ordinance or code enforcement ability shall consider incentives to encourage voluntary compliance with a set of conservation guidelines. Covered entities shall identify and implement best practices in their operations to improve conservation of the resources; and

(2) the covered entity shall consider, and incorporate into its plan if appropriate, at least the following:

(a) water-efficient fixtures and appliances, including toilets, urinals, showerheads and faucets;

(b) low-water-use landscaping and efficient irrigation;

(c) water-efficient commercial and industrial water-use processes;

(d) water reuse systems for both potable and nonpotable water;

(e) distribution system leak repair;

(f) dissemination of information regarding water-use efficiency measures, including public education programs and demonstrations of water-saving techniques;

(g) water rate structures designed to encourage water-use efficiency and reuse in a fiscally responsible manner; and

(h) incentives to implement water-use efficiency techniques, including rebates to customers or others, to encourage the installation of water-use efficiency and reuse measures.

E. The water conservation plan shall contain a section that references the regional water plans in the area that have been accepted by the interstate stream commission.

The section shall cite conservation guidelines mentioned in the regional plan that have been adopted into the covered entity's water conservation plan.

F. A covered entity may at any time adopt changes to its water conservation plan and shall submit changes to the state engineer.

G. After December 31, 2005, neither the water trust board nor the New Mexico finance authority shall accept an application from a covered entity for financial assistance in the construction of any water diversion, storage, conveyance, water treatment or wastewater treatment facility unless the covered entity includes a copy of its water conservation plan."

Section 4. Section 6-21-23 NMSA 1978 (being Laws 1992, Chapter 61, Section 23, as amended) is amended to read: "6-21-23. PROHIBITED ACTIONS.--The authority shall

not:

A. lend money or make a grant other than to a qualified entity;

B. purchase securities other than from a qualified entity or other than for investment as provided in the New Mexico Finance Authority Act;

C. lease a public project to any entity other than a qualified entity; except that the authority may lease a public project to any entity following termination of a lease of the public project to a qualified entity if leasing the public project to an entity other than a qualified entity is necessary to avoid forfeiture or impairment of the public project or a default on bonds whose payment is secured, in whole or in part, by the public project or by lease rentals from the public project;

D. deal in securities within the meaning of or subject to any securities law, securities exchange law or securities dealers law of the United States or of the state or of any other state or jurisdiction, domestic or foreign, except as authorized in the New Mexico Finance Authority Act;

E. issue bills of credit or accept deposits of money for time on demand deposit or administer trusts or engage in any form or manner, or in the conduct of, any private or commercial banking business, or act as a savings bank or savings and loan association or any other kind of financial institution except as authorized in the New Mexico Finance Authority Act;

F. engage in any form of private or commercial banking business except as authorized in the New Mexico Finance Authority Act;

G. lend money, issue bonds, including public-private partnership project bonds, or make a grant for the promotion of gaming or a gaming enterprise or for development of infrastructure for a gaming facility; or

H. after December 31, 2005, except in case of an emergency, accept an application for financial assistance from a municipality, county or other covered entity for a water or wastewater project unless it is submitted with a water conservation plan or a water conservation plan is on file with the state engineer in accordance with the provisions of Section 3 of this 2003 act."

Section 5. Section 72-4A-7 NMSA 1978 (being Laws 2001, Chapter 164, Section 7) is amended to read:

"72-4A-7. CONDITIONS FOR GRANTS AND LOANS.--

A. Grants and loans shall be made only to state agencies or to political subdivisions that:

(1) agree to operate and maintain the water project so that it will function properly over the structural and material design life, which shall not be less than twenty years;

(2) require the contractor of the construction project to post a performance and payment bond in accordance with the requirements of Section 13-4-18 NMSA 1978;

(3) provide written assurance signed by an attorney or provide a title insurance policy that the political subdivision has proper title, easements and rights of way to the property upon or through which the water project proposed for funding is to be constructed or extended;

(4) meet the requirements of the financial capability set by the board to ensure sufficient revenues to operate and maintain the water project for its useful life and to repay the loan;

(5) agree to properly maintain financial records and to conduct an audit of the project's financial records;

(6) agree to pay costs of originating grants and loans as determined by rules adopted by the board; and

(7) except in case of an emergency, submit a water conservation plan with its application if required to do so and one is not on file with the state engineer, pursuant to Section 3 of this 2003 act.

B. Plans and specifications for a water project shall be approved by the authority before grant or loan disbursements to pay for construction costs are made to a state agency or political subdivision.

C. Grants and loans shall be made only for eligible items, which include:

(1) to match federal and local cost shares;

(2) engineering feasibility reports;

(3) contracted engineering design;

(4) inspection of construction;

(5) special engineering services;

(6) environmental or archaeological surveys;

(7) construction;

(8) land acquisition;

(9) easements and rights of way; and
(10) legal costs and fiscal agent fees."

ORDINANCE No. 1038
AN ORDINANCE AMENDING THE TOWN OF SILVER CITY
CODE OF ORDINANCES CHAPTER 30 UTILITIES,

ARTICLE VI, WATER CONSERVATION

WHEREAS, the State of New Mexico has experienced drought conditions for the past two years, and long-term predictions are for unusually dry conditions to continue for as many as 20 years; and

WHEREAS, a June 6, 2000 letter from the Office of the Governor to the Town of Silver City encourages communities to prepare for long-term drought by adopting water conservation ordinances; and

WHEREAS, the Town of Silver City has a Water Conservation Plan, dated February, 1996, but does not currently have specific regulations on water conservation;

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE TOWN OF SILVER CITY, GRANT COUNTY, NEW MEXICO THAT Chapter 30 Utilities be amended as follows:

ARTICLE VI. WATER CONSERVATION

Sec. 30-200. Title.
This article shall be known as the "Water Conservation Ordinance" of the Town of Silver City, New Mexico.

Sec. 30-201. Water conservation compliance.
No person, firm, corporation, water association, or government facility or operation using water from the Town of Silver City water system shall make, cause, use or permit the use of water in a manner contrary to provisions of this Article. All users of domestic wells within the jurisdiction of the Town shall be exempt from the requirements of this Article to the extent of such well use provided as authorized by NMSA 1978, Sections 3-53-1 and 3-53-2, and with the exception of Section 30-202 on prohibition of water waste.

Sec. 30-202. Water waste prohibited.

(a) No person, firm, corporation, or government facility or operation shall waste, cause or permit to be wasted any water from the Town of Silver City water system. Water waste is defined as the non-beneficial use of water. Non-beneficial use includes but is not restricted to the excessive application of water such that it overflows the landscaped area being watered or other area of water use and runs onto adjacent property or public right-of-way.

(b) Restrictions in this Article do not apply to water flows resulting from fire fighting, hydrant flushing or fire training activities; water applied to prevent or abate health, safety or accident hazards, or water flows from routine maintenance of the municipal water system or from temporary water system failures or malfunctions. Restrictions on landscape irrigation do not apply to re-use of grey water, effluent (treated wastewater) or nonpotable water from the "Rock House" on Little Walnut road or other sources, unless otherwise regulated.

Sec. 30-203. Declaration of Water Conservation Levels.

(a) The Town Manager, upon the recommendation of the Utilities Director, is hereby authorized to declare Water Conservation Levels through public notice. The Conservation Levels shall be initiated based upon the relationship between water demand and municipal safe production and delivery capability.

1. "Safe production capability" is 80% of the total water resources available, based
upon well production capacities, booster station capacities, distribution components, storage reserves, aquifer levels, water rights, weather conditions, and historic data.

2. "Total production capability" is 100% of the total water resources available. The
Utilities Director shall determine total production capability and update it as water resource conditions change.

(b) Declarations by public notice shall be made by public service announcements through
electronic media, and shall be published a minimum of one time in daily local newspaper(s) of general circulation. The Water Conservation Level declared shall become effective immediately upon the first announcement.

(c) The following Water Conservation Levels shall govern the use of water by customers using water from the Town of Silver City water system, as prescribed below:

1. Water Conservation Level I: Voluntary Water Conservation.
a. Level I shall be initiated when annual precipitation for each of the previous
two years is equal to or less than 80% of the long-term annual average. This
determination will be based on annual precipitation figures for the period May 1st through April 30th, as measured at the long-term Fort Bayard gage.
b. Water users are encouraged to minimize use of water for landscape irrigation, vehicle and pavement washing, construction, and other water consuming
activities. Voluntary compliance with Level II restrictions is encouraged.

2. Water Conservation Level II: Water Restrictions. Level II shall be initiated when demand is greater than safe production capability for two (2) consecutive weeks. No person or entity using water from the Town's water system shall:
a. Use water outdoors for landscape watering or refilling of ponds or pools except as provided:
i. Water use is restricted to the following days of the week:
a. Properties with even-numbered addresses are restricted to said uses on Monday, Wednesday, Friday, and Sunday, and
b. Properties with odd-numbered addresses are restricted to said uses on Tuesday, Thursday, Saturday, and Sunday.
ii. Landscape irrigation is restricted to the time period before 10 AM and after 6 PM on the applicable day; however, outdoor

irrigation under manual control (e.g. watering from a hose with a shutoff nozzle or from a bucket or watering can) is permissible at any time on the applicable day.

b. Wash vehicles unless a bucket and hose with a positive cut-off nozzle is
used; however these restrictions do not apply to vehicles that must be washed for public health, safety, or welfare, or to commercial car washes.

c. Wash paved areas such as driveways, sidewalks, parking lots, and tennis
courts, except for health or safety.

3. Water Conservation Level III: Water Crisis. Level III shall be initiated when water demand equals or exceeds total production or delivery capability at any time. This level constitutes an emergency situation, and can be declared immediately by the Town Manager. At this level, no person or entity using water from the Town's water system shall use any water outdoors for any purpose unless required for public health, safety, and welfare.

(d) In addition to the restrictions listed above, the Town Manager may impose specific restrictions on large water users if deemed necessary to protect the Town's water resources and health and safety of its citizens. The Town Manager may also consider alternatives to the specified outdoor watering schedules for water users with large turf areas (e.g. half one day, half the next day).

(e) The Utilities Director may make recommendations at any time with regard to moratoriums on the extension of water mains, consistent with Town policy.

Sec. 30-204. Penalties and Enforcement.

(a) Assessment of fees for violations of the provisions of Article VI, Sections 30-200 through 30-203 will be through the city utilities billing department for the responsible party's billing account. Fees and service cutoff may be suspended pending the outcome of an appeal. The schedule for assessment of fees and cutoff of service shall be as follows:

1. Water Conservation Level I: Compliance is voluntary. Warnings will be issued for water waste.

2. Water Conservation Level II:

a. First observed violation: Issuance of notice of violation.
b. Second observed violation: $20 fee.
c. Third observed violation: $50 fee.
d. Fourth observed violation: $100 fee.
e. Fifth observed violation: $100 fee plus cutoff of service.

3. Water Conservation Level III:

a. First observed violation: Issuance of notice of violation.
b. Second observed violation: A fee equal to 25% of the previous month's water bill, but no less than $50 or greater than $500.
c. Third observed violation: A fee equal to 50% of the previous month's water
bill, but no less than $100 or greater than $1000.
d. Fourth observed violation: A fee equal to 50% of the previous month's

water bill, but no less than $100 or greater than $1000, and cutoff of service.

(b) Procedure for assessment of fees: All assessments of fees for violations of the provisions of Article VI, Sections 30-200 through 30-203 shall be upon the issuance of a notice of violation. Within five (5) business days of the issuance of a notice of violation, the responsible party shall be sent by certified mail a copy of the notice of violation, along with a statement of the fee to be assessed. The notice to the responsible party also shall include a notice of the party's right to appeal the assessment pursuant to the provisions of subsection (c) hereof. Fees shall be assessed to the responsible party's billing account, listed as a separate line item on the utility bill, and cutoff of service shall be effected on the sixteenth (16th) day following the expiration of the appeal period, the date of issuance of the determination of any appeal, or the date of the town council's action upon a review hearing, whichever applicable date is later. The fees must be paid within the normal payment period allowed by the town utility billing system.

(c) Appeal of assessment of fees: A responsible party may appeal an assessment of fees or notice of cutoff of service for violations of the provisions of Article VI, Sections 30-200 through 30-203 by delivering to the Town Manager, within ten (10) days after the date the notice of violation was mailed, a written notice of appeal of the imposition of the fee or cutoff of service. The notice of appeal shall identify the property and state the grounds of appeal together with all material facts in support thereof. Upon receipt of the notice of appeal, the Town Manager shall be provided with copies of the notice of violation appealed from and any documents and photographs supporting the notice of violation. Within seven (7) working days of the date he receives copies of the notice of violation and supporting documents, the Town Manager shall issue a written decision on the appeal either upholding the assessment of fees or cutoff of service, modifying the assessment or cutoff, or overruling the assessment or cutoff. Copies of the Town Manager's written decision shall be mailed by certified mail to the appealing responsible party, and sent to the town utility billing department, along with a notice of the responsible party's right to request a review hearing before the Town Council pursuant to the provisions of subsection (d) hereof.

(d) Review of appeal decision: If a responsible party does not agree with the Town Manager's written appeal decision, the party shall, within ten (10) days after the date of mailing of the decision, file with the Town Clerk a written request for a hearing before the Town Council. The request for hearing shall identify the property, attach a copy of the Town Manager's decision, and state the grounds of appeal to the Town Council together with all material facts in support thereof. The Town Clerk shall schedule the hearing for the next regular meeting according to the adopted schedule of the Town Council, providing adequate time to ensure that the public notice requirements can be satisfied, or such later time as is mutually agreed upon by the responsible party and the Town Manager. The Town Clerk shall send written notice by certified mail to the responsible party of the time and place of the hearing before the Town Council. At the hearing testimony and evidence shall be taken under oath or affirmation, and the responsible party shall have the right to present evidence and ask questions of persons who testify as to the alleged facts upon which the assessment of fee or cutoff of service was based and any other relevant and material facts which may aid the Town Council in determining whether the violation of the provisions of Article VI, Sections 30-200 through 30-203 occurred. If, upon such hearing, a

majority of those present and voting of the Town Council are of the opinion the Town Manager's decision was correct, then said decision shall be affirmed; otherwise the Council shall have the power to revise the Town Manager's decision.
(e) Any person who violates the provisions of Article VI, Sections 30-200 through 30-203, for which no other penalty is set forth, shall be subject to the general penalty provision of this Code as set forth in Section 1-9.

(f) Authority to enforce the provisions of this Article shall be assigned to, but not limited to, all police officers, code enforcement officers and meter readers of the Town of Silver City. Other Town employees may be assigned enforcement authority as deemed necessary by the Town Manager.

PASSED, ADOPTED AND APPROVED this 12th day of September, 2000.

BY: (s) Terry Fortenberry
Mayor

ATTEST:

___(s) Dennis L. Hunter___
Town Clerk

Las Cruces Municipal Code

Chapter 28
UTILITIES*

ARTICLE VII.

WATER CONSERVATION

Sec. 28-301. Title; purpose.

This article shall be known as the Water Conservation Ordinance. This article shall both require and encourage all users of water within the city limits to reduce water consumption and waste.

(Code 1988, § 29-361)

Sec. 28-302. Applicability.

(a) The restrictions contained in this article shall apply to all users of city-provided water and to all users of water provided by water utility companies franchised by the city; however, the water use restrictions contained in subsection 28-304(b)(1) shall apply to all water users within the city limits.

(b) The outdoor vegetation watering restrictions in section 28-303 shall not apply to users of irrigation water provided by Elephant Butte Irrigation District, or to users of water provided by mutual domestic water companies or from domestic wells.

(Code 1988, § 29-362)

Sec. 28-303. Outdoor vegetation watering restrictions.

(a) All outdoor vegetation on residential and commercial properties located (i) on the even numbered side of the street shall be watered only on Tuesdays, Thursdays and Saturdays, and (ii) on the odd numbered side of the street shall be watered only on Wednesdays, Fridays and Sundays. For corner buildings or properties having both odd and even numbers, the number shown on the city's or the franchised water companies' utility records shall control.

(b) From April 1 to September 30, all outdoor watering of vegetation is prohibited between the hours of 10:00 a.m. and 6:00 p.m.

(c) A water utility company franchised by the city may apply yearly to the city's utilities division for a waiver from the outdoor vegetation watering restrictions in this section in accordance with the following:

(1) The waiver will be granted by the utilities division if it determines that compliance with these restrictions will negatively impact the company's water system operations. The granting and the renewal of any waiver will be based on the company's consumption patterns being comparable to the city's residential water use.

(2) Each waiver request must be accompanied by monthly water use records for the past year. The utilities division may require that the company provide additional information to justify the waiver request.

(3) If the utilities division denies the waiver, the water company may file a written appeal with the city manager within ten days of the denial. The city manager will issue a final written decision within 20 days of receipt.

(4) The waiver may be revoked by the city in a declared water emergency.

(Code 1988, § 29-363)

Sec. 28-304. Miscellaneous water use restrictions.

(a) The washing of vehicles and other types of mobile equipment shall be done only with a handheld bucket or a handheld hose equipped with a functioning shutoff nozzle for quick rinses. This restriction does not apply to the washing of vehicles or mobile equipment at a commercial carwash or commercial service station. When used in this subsection, the term "bucket" means a container holding five gallons of water or less.

(b) The following uses of water are defined as wasting water and are prohibited:

(1) Allowing water to flow onto adjacent property or onto any street, alley or other public right-of-way.

(2) Watering outdoor vegetation excessively so that water ponds on site.

(3) Failing to repair a water leak within five working days of the discovery of the leak.

(4) Washing sidewalks, driveways, parking areas, tennis courts, patios and other impervious surfaces with a hose, except in emergencies to remove spills of hazardous materials or to eliminate dangerous conditions which threaten the public health, safety or welfare. When used in this subsection, the term "impervious surface" means any surface covered with nonporous material.

(Code 1988, § 29-364)

Sec. 28-305. Penalty, injunctive relief authorized.

(a) Any person who is convicted of a violation of any section of this article shall be guilty of a petty misdemeanor and shall be punished in accordance with section 1-10.

(b) With respect to violations that are continuous in time, each day the violation continues is a separate offense.

(c) Violations that are continuous in time may be abated by injunctive or other equitable relief. The imposition of a criminal penalty does not prevent equitable relief.

(Code 1988, § 29-365)

Sec. 28-306. Exceptions to enforcement.

The following shall constitute exceptions from compliance with this article concerning outdoor vegetation watering restrictions and miscellaneous water use restrictions:

(1) The water flow is a result of natural events such as rain or snow, unless the user is watering at the same time.

(2) The water flow is a result of temporary malfunctions of or vandalism to the municipal water supply system.

(3) The water flow is a result of water used for firefighting purposes, including the inspection and pressure testing of fire hydrants, or the use of water for firefighting training activities.

(4) The use of water is required for the control of dust or the compaction of soil as may be required by municipal codes.

(5) The water is used to wash down areas where flammable or otherwise hazardous material has spilled, creating a dangerous condition.

(6) The water is used to prevent or abate public health, safety or accident hazards when alternate methods are not available.

(7) The water is used for routine inspection or maintenance of the municipal water supply system.

(8) The water is used to facilitate construction within public a right-of-way in accordance with city requirements and good construction practices.

(9) The use of the water is permitted under a variance granted by the city.

(10) The water is used for street sweeping, sewer maintenance or other established utility practices.

(11) Watering contrary to the odd/even or time of day requirements is permitted for one day only where application of chemicals requires immediate watering to preserve an existing lawn.

(12) Watering contrary to the odd/even or time of day requirements is permitted for up to two weeks for newly planted landscaping vegetation.

(Code 1988, § 29-366)

Sec. 28-307. Water emergency; restriction of water use.

(a) The city council may declare a water emergency during a severe drought or during any condition which significantly reduces the city's ability to supply water in order to protect the public health, safety or welfare or to preserve the water supply.

(b) During such a water emergency, the city manager may implement water use restrictions approved by the city council.

(Code 1988, § 29-367)

Secs. 28-308--28-350. Reserved.

CITY OF RIO RANCHO

ORDINANCE NO. 19 **ENACTMENT NO. 03-022**

ADOPTING CHAPTER 17, PUBLIC UTILITIES, ARTICLE 5, AS THE WATER CONSERVATION ORDINANCE

WHEREAS, the City of Rio Rancho is located in a desert where precipitation is limited, and measures must be taken to conserve water; and

WHEREAS, the City wishes to continue to enforce the existing prohibition in the public nuisance ordinance of water escaped from properties; and

WHEREAS, water usage is potentially higher with a two inch or greater meter size and, therefore, water waste from customers with a larger meter size is potentially greater; and

WHEREAS, outdoor water use increases significantly during the months of April through September causing an increase in demand for water supplies. Water losses intensify due to increase in evaporation during the hottest part of the day. It is prudent and in the best interest of the City and its citizens to adopt an outdoor watering schedule for water conservation purposes; and

WHEREAS, drinking water should not be served in eating establishments unless requested by their patrons. This will reduce the waste of water not consumed by the patron and reduce the need for additional water to wash and sanitize unused drinking water vessels; and

WHEREAS, guest linen laundering, including bed linens and towels, should not be changed on a daily basis unless requested by the lodging facility's patrons. This requirement will reduce the use of water not consumed by washing linens for short stays; and

WHEREAS, the City has received input from several citizen groups including the Eagle Ridge Middle School civic class, the Water Conservation Stakeholders Advisory Group, the Water Resources Steering Committee, and other entities who wish to support and promote water conservation through water restrictions; and

WHEREAS, the State of New Mexico has received a less-than-normal supply of precipitation during the past few years. Due to this prolonged lack of precipitation, the Governor has declared a state of drought throughout New Mexico and encourages all citizens to do their part in conserving water.

THEREFORE, BE IT ORDAINED BY THE GOVERNING BODY OF THE CITY OF RIO RANCHO:

Section 1. Chapter 17 Article 5, is hereby adopted to read as follows:

17-5-1 Preamble to the Ordinance

This Ordinance shall address water use recommendations to assist in reducing the overall per capita water use in the City. Water conservation measures are encouraged for all privately owned and government owned properties.

17-5-2 Definitions

A. Bubblers. Bubblers are irrigation heads that deliver water directly to the adjacent soil.

B. Business. A business is a retail facility, office, shopping center, or other facility in the commercial water billing class, other than multi-family or mobile home residential facilities.

C. Eating Establishments. Eating establishments are food service facilities, which serve meals to customers, including those food service facilities in lodging establishments and schools and drive-in food facilities, and excluding health and elderly care facilities.

D. Effluent. Effluent is reclaimed water that has been treated or processed by a wastewater treatment plant and then used for other purposes, such as river discharge or irrigation.

E. Fugitive Water. Fugitive water is water that has escaped from one property onto adjacent property or the public right-of-way. This does not include storm water runoff.

F. Government Facility. Government facility is a facility operated by the City of Rio Rancho, Sandoval County, State of New Mexico, United States, or other governmental entity.

G. Hand Watering. Hand watering is the use of a hand-held watering device such as a hose or bucket for applying irrigation water to landscape or plants in a container.

H. Hospitality Businesses. Hospitality businesses are licensed eating or lodging establishments.

I. Lodging Establishment. Lodging establishment is a licensed motel, hotel, or bed and breakfast establishment, which provides private rooms for overnight stay and provides towels, sheets and/or other linens for its guests to use during their stay.

J. Public right-of-way. Paved or unpaved streets and adjoining public real property, alleys, drainage, gutter or other public easements and lined or unlined drainage channels, which comprise the municipal storm drainage system.

K. Responsible Party. The owner, manager, supervisor, or person who receives the water bill, or person in charge of the property, facility, or operation during the period of time the violation(s) is observed.

L. Runoff. Runoff is water that is not absorbed by the soil or landscape to which it is applied where the application rate exceeds infiltration rate and excess water runs off the property, particularly if there is a severe slope. This definition does not apply to storm water runoff.

M. Spray Irrigation. Spray irrigation is the application of water being sprayed on to landscaped areas by means of a device that propels water through the air in the form of small particles or droplets.

N. Water Waste. Water waste is the non-beneficial use of water that is supplied by any water supply system within the municipality. Non-beneficial uses of water include, but are not restricted to, the following:

1. Landscape water applied in such a manner, rate, or quantity that it regularly overflows the landscaped area being watered and runs onto or seeps into adjacent property or public right-of-way.

2. Landscape water that leaves a sprinkler, sprinkler system, or other application device in such a manner or direction as to spray onto adjacent property or public right-of-way.

3. Washing down of vehicles or hard surfaces such as parking lots, aprons, pads, driveways, or other surfaced areas when water is applied without shut-off hose nozzles in an excessive quantity to flow from that surface onto adjacent property or the public right-of-way.

17-5-3 Applicability

These restrictions apply to all properties within the city limits and/or served by the City's water utility.

17-5-4 Water Waste and Fugitive Water

A. Prohibited acts.

1. Water waste. No person, business firm, corporation, municipal or other governmental facility or operation shall waste, cause, or permit to be wasted, as defined in this article, any water furnished by any water supply system, public or private, within the city of Rio Rancho.

2. Fugitive water flow. No person, business firm, corporation, municipal or other governmental facility or operation shall cause or permit the flow of fugitive water onto the adjacent property or public right-of-way.

B. Exceptions.

1. Waste shall not include:

a. flow resulting from fire fighting or routine inspection of fire hydrants or from fire fighting training activities.

b. water applied as a dust control measure as may be required by regulations or work practice. Effluent shall be used when available and appropriate.

c. water applied to abate spills of flammable or otherwise hazardous materials.

d. water applied to prevent or abate health, safety, or accident hazards when alternate methods are not available.

e. water which reaches or flows onto adjacent property or public right-of-way when caused by an act of nature.

f. flow resulting from a routine inspection, maintenance, utility line breaks, or construction of a water supply system within the municipality.

g. Flow resulting from washing of vehicles, boats, driveways, or sidewalks, municipal flushing of streets, or other occasional applications.

h. water used in the course of installation or maintenance of traffic flow control devices.

i. water used by contractors or utilities in saw-cutting of pavement, compaction, or other use required under terms of their contract.

2. Fugitive water shall not include:

a. storm water run-off.

b. flow resulting from temporary water supply system failures, malfunctions, or vandalism. This flow shall be exempted by the City to non-municipal water systems for the first forty-eight hours after notification of such failure or malfunction is given to the responsible party of the non-municipal system. The City's municipal water supply system shall be exempted provided the failure or malfunction is addressed within forty-eight hours.

c. flow resulting from other municipal emergencies.

17-5-5 Outdoor Watering Restrictions

These restrictions apply to all properties that use spray irrigation within the city limits or are served by the City's water utility.

A. From April 1 through September 30, spray irrigation is allowed from 6:00 p.m. to 10:00 a.m. on all properties.

B. Restrictions in Section A does not apply to the following if a permit or variance has been granted by the City Water Utilities Department:

1. repair and maintenance of irrigation systems;

2. establishment of newly landscaped areas within the first 30 days of planting or watering newly seeded or sodded turf; and

3. a single-day irrigation needed for the application of chemicals needed to safeguard an existing or new landscape; and

C. Restrictions in Sections A. does not apply to the following:

1. water used for dust control or soil compaction.

2. drip irrigation, low emitting bubblers, hand watering, or watering of containerized plants and plant stock.

D. Shutoff nozzles are required on any hoses used for hand watering, car washing, or other outdoor uses.

E. Additional scheduling restrictions may be applied during declared drought or emergency situation.

17-5-6 Hospitality Businesses

A. Serving Water Upon Request. It is prohibited to serve drinking water to eating establishment patrons, unless the patron requests water.

B. Guest Linen Laundering. All lodging establishments shall offer customers the option of not changing sheets and towels in their rooms during their stay.

Lodging establishments shall encourage this practice, at a minimum, through posting of signs in every room instructing customers how to decline replacement linen service.

Lodging establishments with less than ten rooms may encourage this practice through brochures

17-5-7 Enforcement and Fees

A. Enforcement. Except as otherwise provided in this Article, the Utilities Director or designee, and the Director of Public Safety or designee, including code enforcement officers, shall enforce this ordinance, which shall include the inspection of premises and the issuance of notice of violations.

B. Any responsible party who causes, permits, facilitates, aids, or abets any violation of any provision of the ordinance shall be subject to the assessment of fees and penalties stated herein.

C. Schedule for assessment of fees.

1. Schedule for assessment of fees for violations of Chapter 17, Article 5 by Utility customers with at least a 2-inch meter size is:

1. First violation	Warning Notice;
2. Second violation	$ 50;
3. Third violation	$100;
4. Fourth violation	$150;
5. Fifth violation	$200;
6. Sixth violation	$300 fee plus application of a flow restriction device at meter.

2. Schedule for assessment of fees for violations of Chapter 17, Article 5 by Utility customers with less than a 2-inch meter size is:

1. First violation	Warning Notice;
2. Second violation	$ 25;
3. Third violation	$ 50;
4. Fourth violation	$ 75;
5. Fifth violation	$100;

6. Sixth violation	$150 fee plus application of a flow restriction device at meter.

D. Fee assessment schedules shall be applied separately to Sections 17-5-4, 17-5-5, and 17-5-6. For the purpose of assessing fees for violations of Sections 17-5-4, 17-5- 5, and 17-5-6, any previous violation shall not be considered: if a period of two years has elapsed since the violation incurred; if a new owner acquires the property; or if the violation occurred prior to September 1, 2003.

E. Assessment of Fees. Assessment of fees for violations of the regulations in this Article will be through the city utility bills of the responsible party's billing account. Responsible parties shall be notified of the fee through certified mail within 15 days of the violation. Fees shall be assessed to the account within 15 days following expiration of the appeal period set out in the Customer Complaint Procedures section in the Water Utilities Ordinance or issuance of appeal findings and shall be listed as a separate line item on the utility bill. Fees must be paid within the normal payment period allowed by the city utility billing system. Failure to pay will result in disconnection of water service.

F. All fees assessed and collected as a result of violations associated with water conservation pursuant to this Article shall be deposited to the Utility's enterprise operating fund.

G. Application of a flow restriction device at meter may be used after the fifth violation. Only City utility personnel can remove flow restriction devices once the responsible party adequately demonstrates to the City the cause for the violation has ceased or until a variance is granted.

H. Misdemeanor penalties for repeat offenders. Upon the seventh or more violation, petty misdemeanor charges may be brought. Every responsible party receiving seven or more violations as determined in Section 17-5-7 D shall be guilty of a petty misdemeanor and shall be punished by a fine of not more than five hundred dollars ($500.00), but not less than the maximum fee provided in Section 17-5-7 C. Each violation above six shall constitute a separate offense and shall be punishable as such. The penalty section of this ordinance is exclusive and no jail time may be imposed for violations hereunder

17-5-8 Variances to Section 17-5-4 (Water Waste) and 17-5-5 (Watering Restrictions)

A. Administrative variances to the restrictions in §§ 17-5-4 and 17-5-5 may be issued by the Utilities Director or designee, provided that the general intent of this Article has been met, compliance with this article is proven to cause practical difficulties and unnecessary hardship, and all options for abatement through modified water management have been exhausted. The criteria to determine hardship shall include level of capital outlay and the time necessary to come into compliance with this article.

B. Variances may be issued for a period not to exceed one year and shall stipulate both short-term corrective measures and a schedule for completion of long-term corrective measures. Variances may be renewed on an annual basis if long-term corrective measures cannot be completed within one year.

17-5-9 Appeals

Enforcement actions may be appealed pursuant to the appeal process established in Section 17-1-23.

Section 2. Severability Clause.

If any section, paragraph, clause, or provision of this Ordinance, or any on, paragraph, clause, or provision of any regulation promulgated hereunder shall for any reason be held to be invalid, unlawful, or enforceable, the invalidity, illegality, or unenforceability of such section, paragraph,

clause, or provision shall not affect the validity of the remaining portions of this Ordinance or the regulation so challenged.

Section 3. Compiling Clause.

This Ordinance shall be incorporated in and compiled as part of the Revised Ordinances of the City of Rio Rancho (R.O. 1987).

Section 4. Effective Date.

This Ordinance shall become effective sixty (60) days after adoption, then a 30-day period for courtesy warnings will be granted. Fee assessments for violations will not go into effect until 90 days after adoption

ADOPTED THIS 25th DAY OF JUNE 2003

_____

Jim Owen, Mayor

_____

Date

ATTEST:

_____

Tina Gonzales, City Clerk

[SEAL]

Long-Range Water Conservation Strategy Resolution

CITY of ALBUQUERQUE
ELEVENTH COUNCIL

COUNCIL BILL NO. R-173
ENACTMENT NO. 40-1995
SPONSORED BY: Angela M. Robbins

RESOLUTION:

ADOPTING A LONG-RANGE WATER CONSERVATION STRATEGY FOR THE CITY OF ALBUQUERQUE AND THE PROPERTIES SERVED BY THE CITY'S WATER UTILITY.

WHEREAS, the adopted "Albuquerque/Bernalillo County Comprehensive Plan" requires that "The water resources of the metropolitan area shall be managed to ensure permanent adequate supply;" and

WHEREAS, recent findings of the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources indicate that the City is pumping local ground water at a rate that cannot be sustained; and

WHEREAS, conservation can extend the City's supply at a fraction of the cost of other alternatives; and

WHEREAS, active water conservation is a condition of State Engineer consideration of requests to obtain additional water supply; and

WHEREAS, conservation will be a prerequisite for state or federal permits necessary to begin using City surface water resources in more effective ways; and

WHEREAS, protection of the limited ground water resources is a regional issue since all ground water used in the Middle Rio Grande Basin is from the same aquifer; and

WHEREAS, an aggressive strategy which achieves a 30% reduction in water usage in six to ten years will reduce the current average 250 gallons per capita per day to 175 gallons per capita per day and is estimated to reduce water demand in the year 2004 by 37 million gallons a day and water demand in the year 2060 by 57 million gallons a day; and

WHEREAS, Albuquerque's usage averages 250 gallons per capita per day while other southwestern cities of comparable size and climate have successfully reduced their usage to less than 180 gallons per capita per day; and

WHEREAS, City Council Resolution Bill No. R-58, Enactment No. 49-1992, calls for the development of a long-term water conservation strategy for the City of Albuquerque; and

WHEREAS, the aggressive strategy was validated and strengthened by the Mayor's and City Council's Town Hall meetings on Water Conservation on September 9th and 10th of 1994; and

WHEREAS, raising the price of water is probably the most effective method for reducing its usage; and

WHEREAS, low and fixed income residents of Albuquerque and customers using reasonable amounts of water should be protected from excessive increases in water rates; and

WHEREAS, voluntary compliance with most recommended water conservation measures for single family residences is preferable and may be modified to mandatory compliance in the future if desired reductions in usage are not achieved.

BE IT RESOLVED BY THE COUNCIL, THE GOVERNING BODY OF THE CITY OF ALBUQUERQUE:

Section 1. That the City's Long-Term Water Conservation Strategy, as described in the following sections of this Resolution, is hereby adopted and implementation will be initiated in

January or February of 1995.

Section 2. PLANNING AND OVERALL APPROACH. The City shall initiate the following measures.

(A) Promote the regional awareness and planning that is essential to ground water resource management in the Middle Rio Grande Basin and includes the following:

1. A long-range water resource planning process which incorporates the goal of sustainable growth;
2. Inclusion of other city, county, and tribal governments and water users in the planning process;
3. Addressing water quality and quantity issues as well as conservation.

(B) In general, encourage voluntary water conservation for existing single family residences while requiring conservation for other properties.

(C) Apply more stringent requirements to City-owned facilities to set an example within the City.

(D) Set the example for water conservation in the Middle Rio Grande Basin and strive to involve other communities and water users in the conservation effort.

(E) Determine the best use of San Juan-Chama water and reuse of effluent to reduce aquifer depletion.

(F) Embrace the natural and cultural environment of Albuquerque in the water conservation effort.

(G) Evaluate existing land use planning and zoning laws affecting water use and revise them to be consistent with the conservation strategy.

(H) Create a water resources intern program in cooperation with the University of New Mexico's Master of Water Resource Administration program.

Section 3. REDUCTION GOALS. The City shall adopt the following water use reduction goals.

(A) Reduce current overall per capita usage of 250 gallons per capita per day by 30% to achieve 175 gallons per capita per day by the year 2004.

(B) Reduce current summer outdoor usage by 25%

(C) Reduce current year-round indoor usage by 33%.

(D) Reduce peak day usage by 20% within six to ten years.

(E) Set parcel-specific goals for all customers by the year 1998.

(F) Measure and evaluate the effectiveness of the elements of the Water Conservation Strategy on an ongoing basis: revise the Strategy annually, as necessary, to reflect and enhance the effectiveness of its various elements.

Section 4. RATES. The City shall implement the following measures related to rates.

(A) Allow sufficient lead time for extensive public education prior to implementation of higher excess use surcharges.

(B) Retain average residential winter median by meter size for meter sizes up to and including two inch meters.

(C) Utilize excess use surcharge revenues to offset declining revenues resulting from decreased demand. The Mayor shall not increase the excess water use surcharge prior to April 1996. Before any increase in the excess water use surcharge, the Mayor shall

authorize a thorough analysis of alternative surcharge rates, their impact on different categories of water customers in terms of current use, family size, income, etc., and their reasonableness and fairness with regard to financial penalties for individual households failing to meet their water conservation goals. As conservation is achieved and surcharge revenues decrease significantly, alternative funding sources will be necessary.

Section 5. EDUCATION/PUBLIC AWARENESS. The City will initiate or continue the following to educate and get feedback from the community about conservation issues.

(A) Establish a citizens Water Conservation Advisory Committee.

(B) Continue the water conservation marketing and awareness program and provide adequate funding to effectively inform the public of the need for water conservation and of the ways that they can conserve.

(C) Include a bar chart of the previous month's usage and the current month's usage on the monthly bill, in addition to conservation tips and information.

(D) Cooperatively, with the Albuquerque Public Schools, fund a K-12 environmental education specialist in 1995 to develop and implement an ongoing ecological program for water conservation and related environmental issues in our schools.

(E) Continue the annual education programs offered in all public schools.

(F) Collaborate with existing community organizations to promote water conservation.

Section 6. RESIDENTIAL USE/PLUMBING. The City shall implement the following measures to reduce interior/plumbing uses.

(A) Adopt a Plumbing Code amendment requiring low-volume plumbing fixtures for all customers (now mandatory for only residential customers).

(B) Initiate a voluntary residential fixture retrofit program to install, without charge to customers, water-saving retrofit devices in existing residential development.

(C) Implement a 1.6 gallon-per-flush, low-volume toilet rebate program with rebates of up to $100 per toilet for replacement of three gallons or more per flush toilets for all residential and commercial customers.

(D) Actively encourage owners to replace high volume toilets with low- flow toilets whenever a building permit is obtained.

(E) Promote voluntary, City provided water use surveys and retrofit kits for residential customers to reduce both indoor and outdoor usage; target the highest 25% of users but make available to all customers.

(F) Encourage plumbing fixture wholesalers and retailers to sell only low-flow plumbing fixtures.

Section 7. LANDSCAPING/WATER WASTE. The City shall implement the following measures to reduce landscaping water use and water waste.

(A) Adopt the proposed "Water Conservation Landscaping and Water Waste Ordinance" which makes compliance with water conservation measures a condition of water service from the Albuquerque water utility system and requires the following:

1. No watering of City properties in April through September between 10:00 a.m. and 5:00 p.m.; voluntary for private sector;
2. Water even/water odd watering on City properties; voluntary for private sector;

3. No water waste or fugitive water in the public right-of-way, onto adjacent property, or into storm or sanitary sewers;
4. Water waste fees applied to water bill; increasingly higher fees for repeat violations; installation of flow-restriction device at water meter with the eighth violation to provide only enough water for basic drinking and sanitation needs;
5. No more than 20% of landscaped area in high water use plants for new private development or as allowed through water budget formula to achieve comparable low use; voluntary for existing single family residential;
6. No high water use plants for new City development, excepting parks and golf courses, or as allowed through water budget formula to achieve comparable low use;
7. Surcharge on parks or golf course usage above annual allowance; allowance goes down over time;
8. No high water use turf in medians, on slopes steeper than 6:1, or in areas less than ten feet in any dimension; voluntary for existing single family residential;
9. Efficient new irrigation systems;
10. Installation of new sprinkler heads at least eight inches from the curb.

(B) Initiate irrigation system water use surveys on new properties with one acre or more turf area, beginning in the year 1996; voluntary for single family residential.

(C) Combine all City of Albuquerque requirements regarding landscaping into one manual; eliminate conflicts with the conservation strategy.

(D) Initiate Xeriscape landscape retrofit and rebate program offering five cents per square foot rebate or credit, with a customer limit of $150, for replacement of high water use turf and landscape plants with low or medium water use turf and plants.

(E) Initiate efficient irrigation system retrofit and rebate program offering rebates or credits of up to $150 for replacement of old, inefficient irrigation systems with approved water-efficient systems.

(F) Initiate a Xeriscape education program including:

1. Creation of additional Xeriscape demonstration gardens;
2. Expansion of Parks and General Services irrigation efficiency weather network;
3. Sponsoring an irrigation auditor training and certification program;
4. Promotion and participation in Xeriscape research projects;
5. Initiation or cooperation with other agencies on public workshops, tours, videos, newsletters, events, etc.

(G) Improve the effectiveness of water waste enforcement:

1. Escalate fees for repeat offenders; install flow restriction device with eighth violation;
2. Assess fee on first violation observed by enforcement officers;
3. Apply fees to water bill;
4. Hire an irrigation specialist to supervise unit.

Section 8. EVALUATION. After this Resolution has been in effect for approximately nine months from the date of publication, a comprehensive evaluation and analysis shall be conducted by the Public Works Department in which input is received from residents,

businesses, and others. This report shall be forwarded to the City Council.

Section 9. INSTITUTIONAL, COMMERCIAL, AND INDUSTRIAL USE (ICI). The City shall implement the following measures to reduce water use in the Institutional, Commercial, and Industrial billing classifications.

(A) Prepare, through a public process, and adopt a Large Water Users Policy specific to institutional, commercial, and industrial water uses and including, but not limited to, these provisions:

1. Require new customers using over 50,000 gallons per day to prepare and implement a Water Conservation Plan;
2. Prohibit use of City water for the purpose of diluting customer's effluent.
3. Initiate periodic surveys of new customers using more than 300,000 gallons per day; require implementation of auditor's recommendations defined through negotiations with the City;
4. Retrofit existing large water users to reduce use by 2000, in proportion to their growth or downsizing, unless longer period agreed to by the City.

(B) Adopt ordinance prohibiting once-through cooling systems.

(C) Promote City-provided water use surveys and retrofit for the highest 25% of the ICI customers to address both indoor and outdoor usage.

(D) Initiate a City and school building plumbing fixture retrofit program; costs to be shared by the customer and the City.

(E) Implement a strategy for reducing excess water use for City facilities or services.

(F) Initiate a Water Utility unaccounted-for-water loss reduction program including:

1. Water loss reduction program to audit and repair system water losses on a continuous basis;
2. Meter maintenance and replacement program to identify, repair, and/or replace inaccurate or malfunctioning meters;
3. Installation of meters in all unmetered City parks;
4. Development and implementation of strategy to reduce and use well wash water and water system discharge water.

Section 10. Conservation requirements, as they apply to new construction, shall take effect six months after the effective date of this legislation.

Comprehensive water conservation program adopted in March 1995

Albuquerque, New Mexico
Code of Ordinances
This code contains the 2004 S-40 Supplement, current through Ordinance 55-2003

Chapter 6: Water, Sewer, and Streets

ARTICLE 1: WATER

PART 1: WATER CONSERVATION LANDSCAPING AND WATER WASTE

§ 6-1-1-1 SHORT TITLE.

This article shall be known as the "Water Conservation Landscaping and Water Waste Ordinance."

(Ord. 18-1995)

§ 6-1-1-2 INTENT.

(A) To implement the outdoor water use recommendations of the Water Conservation Task Force, as called for in Resolution Bill No. R-58, Enactment No. 49-1992, adopted by the Council in May of 1992.

(B) To assist in reducing overall per capita water use in the city by 30%.

(C) To reduce yard irrigation and irrigation-related water waste, which comprise over 40% of the city's total annual water usage. To reduce peak summer usage, which is two to three times winter usage and determines the need for capital facilities to adequately meet system demand. To reduce irrigation water usage without sacrificing landscape quality by using lower water use plants, improved design and planting practices, different watering practices, and better irrigation system design and maintenance.

(D) To reduce water waste; i.e., overwatering, inefficient watering, or release of excess water which generates fugitive water in the public right-of-way. To reduce damage to publicly owned streets and the public expenditures necessary to repair the damage caused by this wasted water. To increase street safety by reducing the potential of frozen water on public right-of-way.

(E) To initially encourage voluntary water conservation for existing single-family residences while requiring conservation on all other properties. To apply more stringent requirements to city-owned facilities to set an example.

(Ord. 18-1995)

§ 6-1-1-3 DEFINITIONS.

For the purpose of this article, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

ATHLETIC FIELD. A turf area used primarily for organized sports.

AUTOMATIC CONTROLLER. A solid state timer capable of operating valve stations to set the days and length of time water is applied.

BUBBLERS. Irrigation heads which deliver water to the soil adjacent to the heads.

CITY OWNED. Property owned by the City of Albuquerque.

DEVELOPMENT. The construction, erection, or emplacement of one or more buildings, structures, or surface improvements on land which is a premises in order to establish or expand a principal residential or nonresidential use.

DISTURBED SLOPES. Slopes that have been altered from their natural configuration or vegetative cover by human activity.

DRIP IRRIGATION. Low pressure, low volume irrigation applied slowly, near or at ground level to minimize runoff and loss to evaporation.

EVAPOTRANSPIRATION. The quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time.

EVEN-NUMBERED PROPERTIES. Properties whose official address ends in an even number, excluding city parks and golf courses. Landscaped areas associated with a building will use the number of that building as their address. Only one address shall be used for a large landscaped area associated with one building or activity, even if the landscaped area is broken into many separate subareas.

FLOW RESTRICTION DEVICE. Device applied by the water utility to the customer's meter that restricts the volume of flow to the customer.

FUGITIVE WATER. The pumping, flow, release, escape, or leakage of any water from any pipe, valve, faucet, connection, diversion, well, or any facility for the purposes of water supply, transport, storage, disposal, or delivery onto adjacent property or the public right-of-way.

HAND WATERING. The application of water for irrigation purposes through a hand-held hose, including hoses moved into position by hand and left to flow freely or through a shut-off nozzle.

HARVESTED WATER. Precipitation or irrigation runoff collected, stored and available for reuse for irrigation purposes.

HIGH WATER USE TURF. A surface layer of earth containing regularly mowed grass, with its roots, which requires large volumes and/or frequent application of water throughout its life. High water use grasses include but are not limited to varieties of Bluegrass, varieties of Ryegrass, varieties of Fescue, and Bentgrass.

INFILTRATION RATE. The amount of water absorbed by the soil per unit of time, usually expressed in inches per hour.

INSPECTION. An entry into and examination of premises for the purpose of ascertaining the existence or nonexistence of violations of this article.

LANDSCAPE AREA. The entire parcel less the building footprint, driveways, non-irrigated portions of parking lots and required off-street parking. Includes the public right-of-way.

LOW WATER USE PLANTS. Plants which are able to survive without supplemental water once established as specified in the “Albuquerque Plant List”, published by the city.

MAYOR. The Mayor of Albuquerque or his/her designated representative.

MEDIUM AND LOW WATER USE TURF. A surface layer of earth containing regularly mowed grass, with its roots, which requires moderate or low volumes and/or frequency of application of water once established as specified in the "Albuquerque Plant List" published by the city. Low and medium water use grasses include but are not limited to Bermuda and Bermuda hybrids, Zoysia, blue grama, and Buffalo grass.

MEDIUM WATER USE PLANTS. Plants which require some supplemental watering throughout the life of the plant as specified in the “Albuquerque Plant List” published by the city.

MISTER. A device that produces a cooling effect by emitting fine particles of water into the air in the form of a mist.

MULCH. Any material such as leaves, bark, straw, or other materials applied to the soil surface to reduce evaporation.

NEW DEVELOPMENT. Any development approved by the Albuquerque Planning Department on or after October 1, 1995. For development for which landscaping is required, which is all development except single family residential, only that portion approved by the Albuquerque Planning Department on or after October 1, 1995 shall be considered new development. Development approved by the Albuquerque Planning Department prior to October 1, 1995, but not completed by October 1, 1998 shall also be considered new development.

NON-CITY OWNED. All property which is not owned by the City of Albuquerque.

ODD-NUMBERED PROPERTIES. Properties whose official address ends in an odd number, excluding city parks and golf courses. Large landscaped areas associated with a building will use the number of that building as their address. Only one address shall be used for a large landscaped area associated with one building or activity, even if the landscaped area is broken into many separate subareas.

PRECIPITATION RATE. The amount of water applied per unit of time, usually expressed in inches per hour.

PUBLIC RIGHT-OF-WAY. The area of land acquired or obtained by the city, county, or state primarily for the use of the public for the movement of people, goods, vehicles, or storm water. For the purposes of this article the public right-of-way shall include curbs, streets, and storm water drainage inlets.

RESPONSIBLE PARTY. The owner, manager, supervisor, or person who receives the water bill, or person in charge of the property, facility, or operation during the period of time the violation(s) is observed.

RESTRICTED PLANTS. Plants which, as specified in the "Albuquerque Plant List" published by the city, are classified as restricted due to their high water use requirements and their potential for extensive use in landscaping. Restricted plants include high water use turf, clover, and Dichondra.

RUNOFF. Water which is not absorbed by the soil or landscape to which it is applied. Runoff occurs when water is applied too quickly (application rate exceeds infiltration rate), particularly if there is a severe slope. This article does not apply to storm water runoff which is created by natural precipitation rather than human-caused or applied water use.

SHUT-OFF NOZZLE. Device attached to end of hose that completely shuts off the flow, even if left unattended.

SINGLE-FAMILY RESIDENTIAL. A lot or premises upon which is established one dwelling only. Of the allowable principal uses, such use shall be the only use on that lot or premises.

SPRAY IRRIGATION. The application of water to landscaping by means of a device that projects water through the air in the form of small particles or droplets.

SPRINKLER HEAD. A device that projects water through the air in the form of small particles or droplets.

STATIC WATER PRESSURE. The pipeline or municipal water supply pressure when water is not flowing.

TEMPORARY IRRIGATION SYSTEMS. Irrigation systems which are installed and permanently disabled within a period of 36 contiguous months.

VALVE. A device used to control the flow of water in the irrigation system.

WATER WASTE. The nonbeneficial use of water. Nonbeneficial uses include but are not restricted to:

(1) Landscape water applied in such a manner, rate and/or quantity that it overflows the landscaped area being watered and runs onto adjacent property or public right-of-way;

(2) Landscape water which leaves a sprinkler, sprinkler system, or other application device in such a manner or direction as to spray onto adjacent property or public right-of-way;

(3) Washing of vehicles, equipment, or hard surfaces such as parking lots, aprons, pads, driveways, or other surfaced areas when water is applied in sufficient quantity to flow from that surface onto adjacent property or the public right-of-way;

(4) Water applied in sufficient quantity to cause ponding on impervious surfaces on non-city owned property.

(Ord. 18-1995; Am. Ord. 24-1998; Am. Ord. 42-2001)

§ 6-1-1-4 APPLICABILITY.

(A) Section 6-1-1-8, Water Budgets and Planting Restrictions, applies to all new development and to existing golf courses, city owned parks, and city owned athletic fields.

(B) Section 6-1-1-9, Design Regulations, applies to all new development and to major renovations of existing golf courses, city owned parks, and city owned athletic fields *originally constructed after 1971.*

(C) Section 6-1-1-10, Irrigation System Standards, applies to all new development and to expansions or major renovations of existing golf courses, city owned parks, and city owned athletic fields *originally constructed after 1971.* Single family residential shall be exempt from this section.

(D) Section 6-1-1-11, Inspection Requirements, applies to all new development.

(E) This article does not apply to water provided through the Middle Rio Grande Conservancy District for irrigation purposes. Water obtained through non-city water system sources, however, will be included in the calculation of inches per year for the water budgets for golf courses and parks, as described in Section 6-1-1-8.

(F) Certificates of occupancy for all new development except single family residential shall depend upon compliance with all requirements of this article.

(Ord. 18-1995; Am. Ord. 24-1998)

§ 6-1-1-5 WATERING RESTRICTIONS.

These restrictions apply to all properties within the city limits and/or served by the municipal water utility.

(A) All spray irrigation during the period beginning on April 1 and ending on October 1 of each year must occur between 6:00 p.m. and 10:00 a.m. beginning April 1, 2000. This restriction serves as a guideline for landscape watering on non-city owned property during 1999. This restriction shall not apply to drip irrigation and low precipitation bubblers, hand watering, or watering of containerized plants and plant stock.

(B) All spray irrigation on city owned property during the months of December through March must occur between 10:00 a.m. and 2:00 p.m. This restriction serves as a guideline for landscape watering on non-city owned property. This restriction shall not apply to drip irrigation and low precipitation bubblers, hand watering, or watering containerized plants and plant stock. This restriction shall not apply to golf courses or parks that are in regular use or in use for a special event during these hours.

(C) Shutoff nozzles are required on any hoses used for hand watering, car washing or other outdoor uses, excepting hoses on single-family residential.

(D) All city owned properties other than parks and golf courses shall water no more than every other day. All even-numbered properties shall water only on even-numbered dates. All odd-numbered properties shall water only on odd-numbered dates. This restriction serves as a guideline for landscape watering on non-city owned property.

(E) Restrictions in divisions (A), (B) and (D) above do not apply to the following:

(1) Outdoor irrigation necessary for the establishment of newly sodded lawns and landscaping within the first 30 days of planting or watering of newly seeded turf within the first year of planting;

(2) Irrigation necessary for one day only where treatment with an application of chemicals requires immediate watering to preserve an existing landscape or to establish a new landscape;

(3) Water used to control dust or compact soil;

(4) Visually supervised operation of watering systems for short periods of time to check system condition and effectiveness.

(F) The city shall undertake an aggressive public information campaign to address the requirements of the spray irrigation restrictions for the remainder of 1999 and each year thereafter.

(G) 6-1-1-1 through 6-1-1-99 Water Conservation Landscaping and Water Waste shall be reviewed in its entirety in FY/04 as to its effectiveness and for necessary revisions. This evaluation will be incorporated into the FY/04 budget process.

(Ord. 18-1995; Am. Ord. 24-1998; Am. Ord. 54-1999) Penalty, see § 6-1-1-99

§ 6-1-1-6 WATER WASTE.

These restrictions apply to all properties within the city limits and/or served by the municipal water utility.

(A) No person, firm, corporation, or municipal or other government facility or operation shall waste, cause or permit to be wasted any water.

(B) No person, firm, corporation, or municipal or other government facility or operation shall cause or permit the flow of fugitive water onto adjacent property or public right-of-way.

(C) The restrictions in divisions (A) and (B) of this section do not apply to the following:

(1) Storm runoff allowed under provisions of the city's Drainage Ordinance as currently adopted or subsequently amended;

(2) Flow resulting from temporary water supply system failures or malfunctions. These failures or malfunctions shall be repaired as quickly as possible;

(3) Flow resulting from firefighting or routine inspection of fire hydrants or from fire training activities;

(4) Water applied as a dust control measure as may be required under Chapter 9, Article 5 of this code;

(5) Water applied to abate spills of flammable or otherwise hazardous materials, where water is the appropriate methodology;

(6) Water applied to prevent or abate health, safety, or accident hazards when alternate methods are not available;

(7) Flow resulting from routine inspection, operation, or maintenance of the municipal water supply system;

(8) Flow resulting from routine inspection or maintenance of irrigation systems;

(9) Water used by the Traffic Engineering Division, City of Albuquerque, in the course of installation or maintenance of traffic flow control devices;

(10) Water used for construction or maintenance activities where the application of water is the appropriate methodology and where no other practical alternative exists.

(Ord. 18-1995; Am. Ord. 24-1998) Penalty, see § 6-1-1-99

§ 6-1-1-7 SPECIAL PERMITS

These requirements apply to all properties within the city limits and/or served by the municipal water utility.

(A) Use of Misters

(1) The use of misters shall require a special permit, issued by the city. The Mayor shall develop regulations and administrative procedures for the issuance and conditions of such permits. The Mayor shall have the authority to limit the number of permits or revoke permits as deemed necessary to protect the public interest.

(2) Effective April 1, 1999, the use of misters without a permit, or in violation of permit conditions, shall constitute a violation of this article and shall be subject to the fee assessment processes described in §§ 6-1-1-13 and 6-1-1-99.

(3) Any person, firm, corporation, or municipal or other government facility selling, leasing, renting, installing or otherwise making misters available to any other person, firm, corporation, or municipal or other government facility shall provide notification to their customers of the special permit requirement for mister use. Notice may be delivered by prominently posting a sign at the point of purchase or by providing a document to each individual customer. The city shall provide approved language for such notification.

(Ord. 24-1998)

§ 6-1-1-8 WATER BUDGETS AND PLANTING RESTRICTIONS

Subsection (A) of this section applies to all city and non-city owned golf courses, and to all city owned parks and athletic fields. Subsection (B) of this section applies to all new development.

(A) Water Budgets for Parks and Golf Courses.

(1) Parks and golf courses shall use medium and low water use plants as much as possible. High water use turf or other restricted plants shall be allowed only in those areas with heavy usage or foot traffic, such as athletic fields, playgrounds, and golf course tees, greens, and fairways.

(2) All golf courses existing prior to October 1, 1995 will be allowed up to 40 inches of water per acre of landscape area per year. Golf courses using wells must report well usage to the city on a monthly basis. Any usage over the allowable amount will be subject to the excess use surcharge(s) described in division (A)(6) of this section. Usage will be calculated on a per individual golf course basis and shall include municipal and non-municipal water supplies.

(3) All new golf courses or existing golf course expansions permitted by the city after October 1, 1995 will be allowed up to 37 inches per acre of landscape area per year. Any usage over the allowable amount will be subject to the excess use surcharge(s) described in division (A)(6) of this section. Usage will be calculated on a per individual golf course basis and shall include municipal and non-municipal water supplies. The landscaped area for new golf courses shall not exceed 90 acres per 18 holes or 45 acres per 9 holes.

(4) All parks will be allowed up to 35 inches of water per acre of landscape area per year. Any usage over the allowable amount will be subject to the excess use surcharge(s) described in division (A)(6) of this section. Usage will be calculated on a per individual park basis and shall include municipal and non-municipal water supplies.

(5) Athletic fields will be allowed up to 45 inches per acre of landscape area per year. Any usage over the allowable amount will be subject to the excess use surcharge(s) described in division (A)(6) of

this section. Usage will be calculated on a per individual athletic field basis and shall include municipal and non-municipal water supplies.

(6) Any usage over the approved water budget will be subject to the excess use surcharge(s) defined in the Water and Sewer Rate Ordinance as currently adopted or subsequently amended (6-4-1 et seq.), and established by the Mayor's rules and regulations. This surcharge(s) will be calculated on an annual basis and applied to the February water bill for the property. If two different surcharges are defined in the Water and Sewer Rate Ordinance or the Mayor's rules and regulations, the surcharge for excess usage up to 10% of the water budget shall be the lower of the surcharges. The surcharge for excess usage over 10% of the water budget shall be the higher of the surcharges.

(7) For all parks, golf courses and other facilities with greater than ten acres of restricted plants, and developed after the effective date of this section, the owner or developer shall, when available and economically feasible, use reclaimed wastewater, shallow groundwater or other alternative water supplies, as specified by the policies of the Albuquerque Water Resources Management Strategy.

(B) *Planting Restrictions .*

(1) All city owned new development other than parks, golf courses, and housing shall use medium and low water use plants on 100% of the landscape area.

(2) All city owned housing and all non-city owned properties other than golf courses shall not use high water use turf or other restricted plants on more than 20% of the landscape area, except that for single family residential properties;

(a) In the event that 20% of the landscape area is greater than 3,000 square feet, high water use turf and other restricted plants shall not be used on more than 3,000 square feet of the landscape area;

(b) In the event that 20% of the landscape area is less than 300 square feet, high water use turf and other restricted plants may be used on up to 300 square feet of the landscape area.

(Ord. 18-1995; Am. Ord. 1-1998; Am. Ord. 24-1998) Penalty, see § 6-1-1-99

§ 6-1-1-9 DESIGN REGULATIONS

The following regulations apply to all new development, and to expansions or major renovations as existing city owned parks, city and non-city owned golf courses, and city-owned athletic fields *originally constructed after 1971.*

(A) With the exception of temporary irrigation systems needed to establish low water use plants, spray irrigation shall not be used on slopes greater than four feet of horizontal distance per one foot vertical change (4:1).

(B) All existing disturbed slopes and all man-made slopes shall receive erosion control from plantings and/or terracing. Concrete, asphalt, or any other water and air impervious paving/cover will be allowed only where it is the most appropriate methodology and where no other practical alternative exists.

(C) Plants that require spray irrigation or a mowing frequency of more than three times per year shall not be used in street medians, except that spray irrigation may be used in street medians for up to 36 months where the primary objective is to reclaim disturbed areas with low water use plants.

(D) Spray irrigation shall not be used to apply water to any area within eight feet of a street curb or storm sewer inlet. These areas may be irrigated by drip, bubbler, soaker, or sub-surface irrigation systems.

(E) Sprinkler heads shall be installed at least eight inches away from impermeable surfaces.

(F) No spray irrigation shall be used in areas less than ten feet in any dimension excepting within back or side yards of residential properties, or where such an area is contiguous with adjacent property so that the dimension totals ten feet minimum. Within parking lots no spray irrigation shall be used on any area less than 15 feet in any dimension. These areas may be irrigated by drip, bubbler, soaker, or sub-surface irrigation systems.

(G) Any existing features should be evaluated for incorporation in design to include natural drainage, rock outcroppings, stands of native vegetation which can be protected, or detention areas where vegetation has grown and is being supported by nuisance flows or harvested water.

(H) The potential for using harvested water should be evaluated and, when practical, incorporated into landscape design. Such design shall be consistent with the requirements of the city's Flood Hazard Control Ordinance and the Drainage Ordinance as currently adopted or subsequently amended.

(I) Ponds, fountains, wetlands, marshes, water features for wildlife habitat, functional holding ponds or other reservoirs that are supplied in whole or in part by the municipal water supply shall not exceed 500 square feet or surface area unless approved by the Mayor. Multiple water features on the same property will be considered together to determine surface area. Flowing water used in fountains, waterfalls and similar features shall be recirculated.

(Ord. 18-1995; Am. Ord. 24-1998) Penalty, see § 6-1-1-99

§ 6-1-1-10 IRRIGATION SYSTEM STANDARDS

The following standards apply to all expansions or major renovations at existing parks, golf courses and athletic fields *originally constructed after 1971,* and to all new development except single family residential. The standards serve as voluntary guidelines for single-family residential development. In general, irrigation systems shall be designed to be site-specific, reflecting plant type, soil type, infiltration rates, slopes, and prevailing wind direction.

(A) Irrigation systems shall be designed to be in conformance with all provisions of this article. Temporary irrigation systems shall not be required to meet these standards.

(B) Application equipment for which the manufacturer specifies flow rates in gallons per minute (gpm) shall not share a control valve with equipment for which the manufacturer specifies flow rates in gallons per hour (gph). Irrigation systems shall be controlled by an automatic controller equipped with the following features:

(1) Two or more independent programming schedules;

(2) Capable of programming run times in one-minute increments and displaying the programmed run time as a numeric display;

(3) Total program memory retention;

(4) Ability to be fitted with an external rain switch interrupter and soil moisture sensor.

(C) No intentional overspray is allowed where it may obstruct pedestrian traffic on a city-required pedestrian walkway, as defined by the city's Sidewalk, Drive Pad, Curb and Gutter Ordinance as currently adopted or subsequently amended.

(D) Irrigation systems shall be designed such that water pressure at the sprinkler or emitter is not more than 20% in excess of the manufacturer's maximum recommended pressure range for that device. Pressure may be regulated by design or by the installation of a pressure regulating device or devices.

(E) Irrigation systems shall be designed to minimize low head line drainage.

(F) All new development with new spray irrigated landscaped areas totaling one-half acre or more shall have a Landscape Irrigation Audit performed by a Certified Landscape Irrigation Auditor, certified by the Irrigation Association. The auditor shall be independent of the property owner and of all contractors associated with the property. The audits will be conducted in accordance with the current edition of the Landscape Irrigation Auditor's Handbook. The minimum efficiency requirements to meet in the audit are a 60% distribution uniformity for all fixed spray systems and a 70% distribution uniformity for all rotary systems. The results of the audit shall be provided to the city in a letter or other form acceptable to the city and shall be signed by the Auditor. Compliance with this provision is required before the city will issue a Certificate of Occupancy or, in the case of park development, a Letter of Final Acceptance.

(G) All new development with spray irrigated landscapes greater than ten acres shall have the sprinkler heads tested for uniformity of performance using the Center for Irrigation Technology's (CIT) Sprinkler Profile and Coverage Evaluation (SPACE) program, or a comparable assessment acceptable to the city. The sprinkler heads shall have a scheduling coefficient of 1.3 or less for full circle heads and 1.5 or less for partial circle heads, with a rating of 1.0 being perfect. The sprinkler heads shall be installed in the spacing and pressure range tested. The results of this test shall be provided to the city in a form acceptable to the city. Compliance with this provision is required before the city will issue a Certificate of Occupancy or, in the case of park development, a Letter of Final Acceptance.

(Ord. 18-1995; Am. Ord. 24-1998) Penalty, see § 6-1-1-99

§ 6-1-1-11 INSPECTION PROCEDURES

The following procedures apply to all new development:

(A) Inspection by Consent.

(1) Within the scope of his authority, the Mayor may conduct an inspection, with the voluntary consent of an occupant or custodian of the premises to be inspected who reasonably appears to be in control of the places to be inspected or otherwise authorized to give such consent.

(2) Before requesting consent for an inspection, the Mayor shall inform the person to whom the request is directed of the authority under and purposes for which the inspection is to be made and shall exhibit an identification card or document evidencing his authority to make such inspections.

(3) Inspections undertaken pursuant to this section shall be carried out with due regard for the convenience and privacy of the occupants, and during the daytime, unless, because of the nature of the premises, the convenience of the occupants, the nature of the possible violation or other circumstances, there is a reasonable basis for conducting the inspection at night.

(4) Notice of the purpose and approximate time of an inspection of an area not open to the general public shall be sent to the occupants or custodians of premises to be inspected not less than seven days before the inspection is undertaken.

(B) Inspection without Consent.

(1) Upon sufficient showing that consent to an inspection has been refused or is otherwise unobtainable with a reasonable period of time, the Mayor may make application for an inspection order/search warrant. Such application shall be made to a court having jurisdiction over the premises to be inspected. Such application shall set forth:

(a) The particular premises, or portion thereof sought to be inspected;

(b) That the owner or occupant of the premises has refused entry;

(c) That inspection of the premises is necessary to determine whether they comply with the requirements of this article;

(d) Any other reason necessitating the inspection, including knowledge or belief that a particular condition exists on the premises which constitutes a violation of this article; and

(e) That the Mayor is authorized by the city to make the inspection.

(2) The application shall be granted and the inspection order/search warrant issued upon a sufficient showing that inspection in the area in which the premises in question are located, or inspection of the particular premises, is in accordance with reasonable legislative or administrative standards, and that the circumstances of the particular inspection for which application is made are otherwise reasonable. The court shall make and keep a record of the proceedings on the application, and enter thereon its finding in accordance with the requirements of this section.

(3) While executing the inspection order/search warrant the Mayor shall, if the premises in question are unoccupied at the time of execution, be authorized to use such force as is reasonably necessary to effect entry and make the inspection.

(4) While conducting the inspection the Mayor shall, if authorized by the court on proper showing, be accompanied by one or more law enforcement officers authorized to serve search warrants who shall assist the Mayor in executing the order at his direction.

(5) After execution of the order or after unsuccessful efforts to execute the order, as the case may be, the Mayor shall return the order to the court with a sworn report of the circumstances of execution or failure thereof.

(Ord. 18-1995; Am. Ord. 24-1998) Penalty, see § 6-1-1-99

§ 6-1-1-12 VARIANCES AND APPEALS

The Mayor shall be responsible for the enforcement of this article. The Mayor may prescribe policies, rules, or regulations to carry out the intent and purposes of this article.

(A) Variances to § 6-1-1-5 (Watering Restrictions) and § 6-1-1-6 (Water Waste), and § 6-1-1-7 (Special Permits).

(1) Administrative variances to the restrictions in §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7 may be issued by the Mayor or his/her designee, only for the purposes of installing or retrofitting landscaping, provided that the general intent of this article has been met, compliance with this article is proven to cause practical difficulties and unnecessary hardship, and all options for abatement through modified water management

have been exhausted. The criteria to determine hardship shall include level of capital outlay and time required to be in compliance with this article.

(2) Variances may be issued for a period not to exceed one year and shall stipulate both short-term corrective measures and a schedule for completion of long-term corrective measures. Variances issued to accommodate the installation or retrofitting of landscaping are only applicable to the site where the construction that will increase the possibility of wasted water is to occur. The variance shall apply only for the period of construction. As of the date of this legislation any existing variances shall be subject to these provisions. Variances must be renewed on an annual basis if long-term corrective measures cannot be completed within one year.

(B) Appeal of § 6-1-1-5 (Watering Restrictions), § 6-1-1-6 (Water Waste), and § 6-1-1-7 (Special Permits). Any responsible party may appeal fees for violations of §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7 to the City Hearing Officer by filing an appeal within seven calendar days of receiving a notice of violation. Such request shall be made in writing and filed in the Office of the City Clerk. The appeal shall identify the property and state the grounds of appeal together with all material facts in support thereof. A filing fee of $20 shall be added to the water bill in the event the violation is upheld by the Hearing Officer. When a hearing is requested, the Hearing Officer shall send written notice by certified mail, return receipt requested, to the appellant of the time and place of the hearing. At the hearing the appellant shall have the right to present evidence as to the alleged fact upon which the Mayor based the determination of the need for assessment of fee or restriction of service and any other facts which may aid the Hearing Officer in determining whether this article has been violated. The Hearing Officer shall, within seven working days following the hearing, issue a written decision specifying the fee, if appropriate, and the action that must be taken to avoid additional penalty. Fees will be void and service will not be restricted if the written decision is not issued within seven working days.

(C) Judicial Review. The exclusive remedy for parties dissatisfied with the action of the City Hearing Officer on §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7 shall be the filing of a petition for a writ of certiorari with the State District Court. The petition for review shall be limited to the record made at the administrative hearing held pursuant to this article.

(D) Variances to §§ 6-1-1-8 through 6-1-1-10 requirements. A variance to the regulations in §§ 6-1-1-8 through 6-1-1-10 may be issued by the Mayor, through the Zoning Hearing Examiner, provided that the general intent of this article has been met and compliance with this article is proven to cause practical difficulties and unnecessary hardship. The variance procedure for this article will comply with the variance procedure in the Zoning Code as currently adopted or subsequently amended. (This procedure is described in § 14-16-4-2.) Appeals of decisions of the Zoning Hearing Examiner are to the Environmental Planning Commission. Appeals of decisions of the Environmental Planning Commission are to the City Council. Appeal is made by filing written notice with the Planning Department within 15 days after the request for variance has been denied. Appeal procedures will comply with those in the Zoning Code, § 14-16-4-4.

(Ord. 18-1995; Am. Ord. 24-1998; Am. Ord. 49-2003)

§ 6-1-1-13 FEES; ASSESSMENT

(A) Fees and Restriction of Service. Any responsible party who violates any of the provisions of §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7 shall be subject to progressively higher fees and flow restriction until the violation ceases or a variance is granted. The assessment of fees and application of flow restriction shall be consecutive for violations separated by less than three calendar years. Fees and flow restriction shall be suspended pending the outcome of an appeal or variance request.

(B) Assessment of Fees. Assessment of fees for violations of the regulations in §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7 will be through the city utility bills for the responsible party's billing account. Fees shall be assessed to the account within 15 days following expiration of the appeal period or issuance of appeal findings and shall be listed as separate line item on the utility bill. Responsible parties shall be notified of the fee through certified mail within 15 days of the violation. Fees must be paid within the normal payment period allowed by the city utility billing system.

(C) In lieu of fees for violations of §§ 6-1-1-5 and 6-1-1-6, the responsible party may have a landscape water audit performed by an authorized landscape irrigation auditor, certified by the Irrigation Association. The audit will be conducted in accordance with the current edition of the Landscape Auditor's Handbook. The audit must be performed within 30 days of notification of violation and the audit

recommendation must be implemented within 60 days of the audit. If these deadlines are not met, the fees for violation will apply.

(Ord. 18-1995; Am. Ord. 24-1998) Penalty, see § 6-1-1-99

§ 6-1-1-99 PENALTY.

(A) The schedule for assessment of fees and application of flow restriction for a violation of §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7 shall be as follows:

(1) First observed violation – $20;

(2) Second observed violation – $50;

(3) Third observed violation - $100;

(4) Fourth observed violation - $300;

(5) Fifth observed violation - $400;

(6) Sixth observed violation - $600;

(7) Seventh observed violation - $800;

(8) Eighth observed violation - $1,000;

(9) Ninth or more observed violation: Either a $1,000 fee per violation plus application of a flow restriction device at meter or a $2,000 fee per each violation. The flow restriction device cannot be removed by the responsible party and will not be removed by the utility until the responsible party adequately demonstrates to the city that the violation has ceased or until a variance is granted.

(B) For the purpose of assessing fees or flow restriction for violations of §§ 6-1-1-5, 6-1-1-6, and 6-1-1-7, any previous violation shall not be considered if:

(1) A period of five years has elapsed since the violation was incurred; or

(2) The property is acquired by a new owner; or

(3) The violation occurred prior to July 1, 1998.

(C) Any responsible party who violates any provision of §§ 6-1-1-8 through 6-1-1-10 shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine not to exceed $500 and/or imprisonment for a period not to exceed 90 days. Application of fines for violations of the regulations in §§ 6-1-1-8 through 6-1-1-10 will comply with the Zoning Code as currently adopted or subsequently amended. (See §§ 14-16-4-1 through 14-16-4-12, and 14-16-4-99).

(D) Any person who violates the provisions of this article for which no other penalty is set forth, shall be subject to the general penalty provision of this code set forth in § 1-1-99.

(Ord. 18-1995; Am. Ord. 24-1998; Am. Ord. 42-2001; Am. Ord. 49-2003)

PART 4: WATER CONSERVATION LARGE USERS

§ 6-1-4-1 SHORT TITLE.

This article shall be known as the “Water Conservation Large Users Ordinance.”

(Ord. 18-1998)

§ 6-1-4-2 INTENT.

(A) To implement the recommendations related to large water users called for in Resolution Bill No. R-173, Enactment No. 40-1995, adopted by the Council in March of 1995.

(B) To assist in reducing overall per capita water use in the city by 30% from 250 to 175 gallons per person per day.

(C) To require development, adoption, and implementation of water conservation plans for customers using large amounts of water through a cooperative process with the city.

(D) To assist large users in identifying ways to reduce water use.

(E) To formalize monitoring and feedback for large users on meeting approved goals for water use reductions.

(Ord. 18-1998)

§ 6-1-4-3 DEFINITIONS.

For the purpose of this article, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

ATHLETIC FIELD. Physically defined high water use turf area used regularly for athletic practices and/or games.

EXISTING CUSTOMER. Any city water system customer for which a water meter was installed prior to the effective date of this article.

LANDSCAPED AREA. The entire parcel less the building footprint, driveways, and non-irrigated portions of parking lots.

LARGE USER. Any city water system customer which used or uses in excess of 50,000 gallons per day in 1997 or any calendar year thereafter in which annual use is averaged over the year (50,000 gallons per day equals 18.25 million gallons or 24,398 units annually). Usage for multiple meters serving the same geographic facility will be added together and considered one customer.

LOW FLOW FIXTURES. Plumbing fixtures as follows: 1.6 gallons or less per flush toilets, 1.0 gallon or less per flush urinals, 2.5 gallons or less per minute shower heads, 2.5 gallons or less per minute faucets and/or aerators.

NEW CUSTOMER. Any city water system customer for which a water meter was not installed prior to the effective date of this article.

VERY LARGE USER. Any city water system customer which used or uses in excess of 300,000 gallons per day in 1997 or any calendar year thereafter in which annual use is averaged over the year (109.5 million gallons or 146,390 units annually). Usage for multiple meters serving the same geographic facility will be added together and considered one customer.

(Ord. 18-1998)

§ 6-1-4-4 APPLICABILITY.

All sections of this article apply to all large and very large users within the city limits and/or served by the municipal water utility, excepting customers which receive over 80% of their water from sources other than the city and public and private golf courses and parks, which are regulated by the Water Conservation Landscaping and Water Waste Ordinance. Compliance with this article is a condition of service from the utility. Private well usage will be included in the calculation of total usage and surcharges.

(Ord. 18-1998)

§ 6-1-4-5 WATER USE REQUIREMENTS.

(A) All new and existing large users shall use proven, economically feasible, most effective technology to minimize the amount of water used, including but not limited to water used for cooling, heating, processing, and operations.

(B) New large users shall:

(1) Comply with the landscaping requirements for new development in the Water Conservation Landscaping and Water Waste Ordinance;

(2) Use low flow fixtures in all kitchen facilities and bathrooms.

(C) Existing large users shall:

(1) Reduce water use for landscaped area to 35 inches per acre by 2004, excluding athletic fields at schools;

(2) Reduce water use for school athletic fields to 45 inches or less per acre per year;

(3) Use or convert to low flow fixtures in all kitchen facilities and bathrooms by 2004;

(4) For multi-family residential large users, be exempted from fully complying with divisions (C)(1) and (3) if usage equals or averages, on an annual basis, less than 180 gallons per day unit;

(5) For mobile home parks, be exempted from fully complying with divisions (C)(1) and (3) if usage equals or averages, on an annual basis, 260 gallons per day per unit.

(Ord. 18-1998)

§ 6-1-4-6 USAGE PROJECTIONS.

(A) All large users shall assess their projected usage, in cooperation with the city, by developing the following:

(1) Description of all uses of water within the facility;

(2) A plan for improvements to be implemented prior to 2004;

(3) Projections of average annual, monthly, and daily water use through 2004;

(4) Projections of annual water costs, based on current rates;

(5) Projections of annual sewer costs, based on current rates;

(6) Projections of annual energy savings through 2004 related to reduced water use, if applicable, based on current rates;

(7) Projections of changes in annual pretreatment costs through 2004 related to reduced water use, if applicable.

(B) Existing large users shall also include the following, based on information provided by the city:

(1) Average annual, monthly, and daily water use over the last three years;

(2) Last three years' annual water and sewer costs.

(Ord. 18-1998)

§ 6-1-4-7 WATER CONSERVATION PLAN REQUIREMENTS.

(A) All large users shall develop a water conservation plan, in cooperation with the city, which includes:

(1) A policy statement reflecting the commitment of the large user to conservation;

(2) Findings from § 6-1-4-6;

(3) Improvements to be implemented by 2004, listed by year and specific type of improvement;

(4) Annual goals and water budget for water usage from the year plan is proposed through 2004 and any significant changes after 2004;

(5) A plan for promoting water conservation to employees and/or residents;

(6) A contact person with the city for implementation of this article.

(B) Existing large users' water conservation plans shall also include:

(1) Conservation-related improvements already made;

(2) A schedule for converting to low water use plumbing and landscaping.

(C) Large users shall also:

(1) Work with the city to evaluate and, if feasible, implement utilization of appropriately treated industrial sewage return flow to the city's system in alternate ways, such as for deep injection well recharge and for irrigation purposes; sharing of costs to implement these solutions will be negotiated;

(2) Communicate with similar water users, keep informed of new developments to reduce water use, and implement new processes as feasible;

(3) Work in partnership with the city, agencies, companies, and/or universities involved in research to facilitate development and sharing of more efficient ways to use water.

(Ord. 18-1998)

§ 6-1-4-8 PLAN APPROVAL.

(A) Large users and very large users shall develop and seek approval of a water conservation plan within five months of notification by the city of the applicability of this article to the customer.

(B) The city will issue a plan approval, based on the customer's water conservation plan, as negotiated by the city and the customer. For new customers, approval must occur prior to issuance of a city water meter. For existing customers, plan approval must occur within eight months of notification by the city of the applicability of this article to the customer, unless the plan is being mediated or appealed. Plan approval will be based on compliance with § 6-1-4-6(A)(1)-(3), § 6-1-4-6(B)(1), § 6-1-4-7(A)(1)-(6), and § 7(B)(1)-(2) of this article and any additional commitments by the customer to make improvements to use water more efficiently.

(Ord. 18-1998)

§ 6-1-4-9 PLAN REVISIONS.

Either the customer or the city may initiate a plan revision at any time except during the months of November through February to alter inaccurate projections, reflect growth or decline at the facility, or accommodate other significant changes. Plan revisions will not be made to accommodate minor, short-

term fluctuations caused by line breaks, leaks, fire flow delivery, and weather. No more than two revisions may be initiated by the customer during any 12 month period. The city will notify customers prior to making plan revisions. Revisions will be made only if the projections/goals will be changed by at least 5%.

(Ord. 18-1998)

§ 6-1-4-10 VERY LARGE USERS.

(A) Very large users are subject to the same requirements as large users.

(B) In addition, prior to plan submittal, existing very large water users must provide an audit of their uses of water by a qualified expert accepted by both the city and the customer. Implementation of the auditor's recommendations will be subject to negotiation with the city. The city may terminate water service to any very large user refusing to implement improvements the city considers reasonable, subject to the provisions described in § 6-1-4-14.

(Ord. 18-1998)

§ 6-1-4-11 NOTIFICATION.

(A) The city will notify all existing large users of the requirements in this article and its applicability within 18 months of the final adoption of the article, starting with the largest users and moving downward. Large users are not required to submit plans prior to their notification in order to allow time for adequate staff review and approval.

(B) All large water users with approved plans will be informed of their annual usage relative to their projected usage every year prior to March 31. Notification to customers who have achieved their final goal for two consecutive years will not continue unless usage exceeds the reduction goal in a subsequent year. Notification to customers who exceed their goal will continue indefinitely.

(Ord. 18-1998)

§ 6-1-4-12 VARIANCES.

(A) The Mayor shall be responsible for the enforcement of this article. The Mayor may prescribe policies, rules, or regulations to carry out the intent and purposes of this article.

(B) Administrative variances to the restrictions in § 6-1-4-5 through § 6-1-4-7 may be issued by the Mayor or his/her designee, provided that the general intent of this article has been met, compliance with this article is proven to cause practical difficulties and unnecessary hardship, and all reasonable options for abatement have been exhausted. The criteria to determine hardship shall include level of capital outlay and time required to be in compliance with this article.

(Ord. 18-1998)

§ 6-1-4-13 MEDIATION AND APPEALS.

(A) In the event that the customer and the city cannot agree on the customer's plan and annual goals, a mediation will be scheduled through the city's Dispute Resolution Office. The goal of the mediation is to create a mutually acceptable plan with the help of a third party mediator. The mediation will be scheduled by the Dispute Resolution Office within three weeks of the request. Follow-up mediations, if necessary, will be scheduled as quickly as possible. Costs for the mediation will be split equally between the city and the customer. Based on the mediation(s) and any subsequent discussions between the city and the customer, a plan will be proposed for approval within ten working days of the final mediation. In the event agreement is not reached through the mediation process, the city will propose a plan for approval within 12 working days of the final mediation.

(B) Any large user dissatisfied with the plan proposed by the city following the mediation may appeal the plan to the City Hearing Officer by filing an appeal within seven calendar days of receipt of the proposed plan. Such request shall be made in writing and filed in the Office of the City Clerk. The appeal shall include the proposed plan and state the customer's disagreement with the proposed plan, together with all material facts in support thereof. When a hearing is requested, the City Hearing Officer shall send written notice by certified mail, return receipt requested, to the appellant of the time and place of the hearing. At the hearing, the appellant and the city shall have the right to present evidence to aid the City Hearing Officer in determining whether the proposed plan should be approved. The City Hearing Officer shall, within seven working days following the hearing, issue a written decision specifying any modifications to the plan that must be made prior to plan approval. If no modifications are required by the City Hearing Officer, an appeal filing fee of $20 shall be added to the customer's water bill.

(C) The exclusive remedy for parties dissatisfied with the decision of the City Hearing Officer shall be the filing of a petition for a writ of certiorari with the State District Court. The petition for review shall be limited to the record made at the hearing held by the City Hearing Officer pursuant to this article.

(Ord. 18-1998)

§ 6-1-4-14 COMPLIANCE; NONCOMPLIANCE.

(A) Failure to comply with the provisions of this article to develop and seek approval of a water conservation plan within five months of notification by the city of the applicability of this article to the customer will result in city assignment of annual water usage goals, based on the customer's past usage, estimated potential for reductions, and the 30% reduction goal adopted in Resolution 40-1995.

(B) Compliance with this article is a condition of service from the utility.

(C) Water conservation staff or consultants authorized for this purpose by the Mayor may conduct an inspection of a customer's property for the purpose of assessing proposed plan validity and/or compliance with this article or approved plan. Inspections shall be conducted with the voluntary consent of the customer or the customer's representative. Inspection is deemed a condition of service. Customer refusal of an inspection for these purposes will result in city assignment of goals as described in division (A) above.

(Ord. 18-1998)

§ 6-1-4-15 EFFECTIVE DATE.

This article shall become effective five days after publication in full.

(Ord. 18-1998)

PART 5: WATER CONSERVATION WATER BY REQUEST

§ 6-1-5-1 INTENT.

The public purpose of this ordinance is to:

(A) Assist in reducing overall per capita water use in the city, thereby helping to ensure a sustainable supply of water;

(B) Eliminate unnecessary use of water in restaurants by serving water to customers only when requested, thereby reducing water served and water used to wash glasses;

(C) Educate water system customers and hospitality industry clientele about and eliminate the unnecessary use of water by reducing the frequency of washing of sheets, towels, and other linens; and

(D) Encourage government facilities and businesses to eliminate waste and use water efficiently.

(Ord. 2-2001)

§ 6-1-5-2 SHORT TITLE.

This ordinance shall be known as the "Water Conservation Water by Request Ordinance."

(Ord. 2-2001)

§ 6-1-5-3 DEFINITIONS.

For the purpose of this article, the following definitions shall apply unless the context clearly indicates or requires a different meaning:

BUSINESS. Retail facility, office, shopping center or other facility in the commercial water billing class, other than multi-family or mobile home residential facilities.

GOVERNMENT FACILITY. Facility operated by the City of Albuquerque, Bernalillo County, State of New Mexico, United States, or other governmental entity.

LODGING ESTABLISHMENT. A motel, hotel, or bed and breakfast establishment which provides private rooms for overnight stay and provides towels and/or sheets and/or other linens.

RESTAURANT. A food service facility which serves meals to customers, including those food service facilities in lodging establishments and schools and drive-in food facilities, and excluding health and frail elderly care facilities.

(Ord. 2-2001)

§ 6-1-5-4 APPLICABILITY.

All sections of this article apply to all restaurants, lodging establishments, government facilities, and businesses within the city limits and/or served by the municipal utility. Compliance with the ordinance is a condition of service from the utility.

(Ord. 2-2001)

§ 6-1-5-5 DRINKING WATER SERVICE.

All restaurants shall provide drinking water only as specifically requested by the customer.

(Ord. 2-2001)

§ 6-1-5-6 LINEN WASHING SERVICE.

All lodging establishments shall offer customers the option of not changing sheets and towels in private rooms for stays of less than five days. Lodging establishments shall encourage this practice, at a minimum, through posting of signs in every room instructing customers how to avoid linen service for stays less than five days. Lodging establishments with less than ten rooms may encourage this practice through brochures or other general promotional materials rather than signs in each room.

(Ord. 2-2001)

§ 6-1-5-7 EDUCATING EMPLOYEES, CLIENTS, AND CUSTOMERS.

The city shall work cooperatively with government facilities and businesses to post signage informing and educating employees, clients, and customers about the need to and how to save water.

(Ord. 2-2001)

§ 6-1-5-8 ASSESSMENT OF FEES.

Any responsible party who violates the provisions of this ordinance shall be subject to progressively higher fees until the violation ceases. The schedule for assessment of fees is as follows.

First violation	$20
Second violation	$50
Third and additional violation	$100

Assessment of fees for violations of this ordinance will be through city utility bills and placed on the responsible party's billing account. The responsible party may appeal fees for violation of this ordinance and the appeal process shall follow the process set forth in § 6-1-1-12(B) of the Water Conservation Landscaping and Water Waste Ordinance. Fees shall be assessed to the responsible party's billing account within 15 days following expiration of the appeal period or issuance of appeal findings and shall be listed as a separate line item on the utility bill. Responsible parties shall be notified of the fee through certified mail within 15 days of the violation. Fees must be paid within the normal payment period allowed by the city utility billing system. Fees shall be suspended pending the outcome of an appeal. Each day in which a violation occurs shall constitute a separate offense. The responsible party will be given seven days to comply with this ordinance before another fee may be assessed.

(Ord. 2-2001)

SANTA FE CITY CODE

COUNTY OF SANTA FE
STATE OF NEW MEXICO

Text amendments included through September 30, 2003

Supplement No. 55

CHAPTER XXV WATER

25-1 General Regulations
25-2 Comprehensive Water Conservation Requirements
25-3 Water Waste
25-4 Santa Fe Municipal Water System
25-5 Emergency Water Regulations
25-6 Reserved

CHAPTER XXV WATER

25-1 GENERAL REGULATIONS.

25-1.1 Definitions.*

As used in this section:

Construction means any new residential, commercial or industrial construction and/or renovation, including but not limited to any townhouse, hotel, motel or commercial unit not completed or under construction on the effective date of this Ordinance.

Effluent for purposes of this chapter means treated wastewater whether publicly or privately owned.

Fugitive water means the pumping, flow, release, escape, or leakage of any water from any pipe, valve, faucet, irrigation system or facility onto any hard surface such that water accumulates as to either create individual puddles in excess of ten (10) square feet in size or cause flow along or off of the hard surface or onto adjacent property or the public right-of-way, arroyo, or other water course, natural or manmade. Fugitive water also means, during the irrigation of landscaping, the escape or flow of water away from the landscaping plants being irrigated even if such flow is not onto a hard surface. Excluded from this definition is incidental runoff caused by vehicle washing (provided that a shut-off-nozzle is used), the periodic draining of swimming pools and spas, and the intentional washing of hard surfaces for an explicit public health, safety, or sanitation purpose.

Golf course means the turf area used primarily for golf that includes play areas such as greens, tees, fairways, and roughs.

***Grey* water** means household wastewater other than from water closets and kitchen sinks.

Occasional flow means weekly residential or commercial applications of water for specific washing or cleaning purposes where the water specifically used for that purpose is monitored through the use of quick-acting positive shutoff hose nozzle by the responsible party and allowed to flow into adjacent property or public or private right-of-way or easement.

Private right-of-way means paved or unpaved streets, alleys, drainage or other private easements and lined or unlined drainage channels, which comprise or impact the local or municipal storm drainage system.

Public right-of-way means paved or unpaved streets, alleys, drainage, or other public easements and lined or unlined drainage channels, which comprise the municipal storm drain-age system.

Responsible party means the owner, manager, supervisor, or person in charge of the property, facility or operation during the period of time the violation(s) are observed.

Santa Fe watershed means that area owned by the city or the U.S. Forest Service lying east of the Santa Fe grant, maintained for the city's water supply.

Sports field means a turf area used primarily for organized sports such as football, soccer, baseball, etc.

Waste means any nonbeneficial use of water within the city limits including that caused by the pumping of wells.

Waste includes but is not limited to the following:

A. Leaks to indoor and outdoor plumbing system (faucets, hose bibs, showerheads, toilets, etc.) in excess of 0.25 gallons per minute. Residential water users, both single family and multi-family are exempt from the indoor plumbing aspect of this definition.

Wastewater for purposes of this chapter means the liquid and water carried waste or sewage from residential dwellings, commercial buildings, industrial and manufacturing facilities and institutions whether treated or untreated.

Water means water provided through any system through which the residents of the city receive their water or any extensions thereof over which the city has jurisdiction.

Water shortage means a condition wherein the real availability of the supply of water is less than the projected demand for water as defined by the city upon review of available data.

(Ord. #1991-4, §1; Ord. #2001-33, §1; Ord. #2003-25, §27; Ord. #2003-26, §2)

25-1.2 Reserved.*

25-1.3 Reserved.**

(Code 1953, §27-3; Code 1973, §35-3; SFCC 1981, §4-14-3)

25-1.4 Enforcement.

A. *Enforcement.* There shall be three (3) modes of enforcement: payment of administrative fees; discontinuance of water service; and prosecution of petty misdemeanors through the municipal court.

(1) Administrative fees. The following administrative fees shall be assessed for violations of the provisions in Chapter XXV by customers of the municipal water system, whether inside or outside the city limits. Fees shall be assessed on the customer's utility bill. All violations on a single date at a single customer address shall constitute a single offense for purposes of enforcement of this chapter. The fees within a calendar year shall be: twenty dollars ($20.00) for the first violation at a given customer's address; fifty dollars ($50.00) for the second violation at the same customer address; one hundred dollars ($100.) for the third violation at the same customer address, and two hundred dollars ($200.) for the fourth and each additional violation.

(2) When a violation of this chapter occurs, and the water division director or his or her designee determines that the specific circumstances of the violation are of such a serious nature as to require immediate measures and abatement, the director or designee may take steps to temporarily shut off the water source or discontinue the water service pursuant to its duly adopted procedures as a means of compelling compliance with this chapter. The city may effect such measures by entry upon private premises if the water service or city water meter is located on private premises. Any violation which depletes the water system during water emergency management stage 2 or greater shall be deemed to deplete water essential to maintain fire flows and shall be cause for discontinuance of water service following a twenty-four (24) hour notice as set forth in Rule No. 9 of Exhibit A of this chapter.*

(3) For water users within the city limits but not a municipal water system customer, violations shall be a petty misdemeanor subject to prosecution in the municipal court.

(Code 1953, §27-5; Code 1973, §35-5; SFCC 1981, §4-14-4; Ord. #2001-34, §3; Ord. #2003-25, §29)

25-1.5 Reserved.**

25-1.6 Right of Entry.

A. The city of Santa Fe is authorized to enter on private premises for the purpose of inspecting all water appliances and uses where a public nuisance occurs or during times of temporary restrictions, pursuant to this chapter.

B. The city shall have the right to ingress and egress to and from the customer's premises at reasonable times for the purpose of inspecting, maintaining, testing, reading, changing, installing, or removing its meters; if such representative, after showing proper credentials and identification, is refused admittance or hindered or prevented from performing the above duties, the water service may be discontinued until free access is given in accordance with Rule No. 9 Paragraph C.3.***

(Code 1953, §27-6; Code 1973, §35-6; SFCC 1981, §4-14-6; Ord. #1991-4, §4; Ord. #2003-25, §31)

25-1.7 Illegal Use of Hydrants or Connections to Water Sources.

It is unlawful to turn the water on or off at any hydrant or connection without permission from the owner of the hydrant or the fire department. (Code 1953, §27-7; Code 1973, §35-7; SFCC 1981, §4-14-7; Ord. #1991-4, §5)

25-1.8 Fluoridation of Water Supply.

A. The water supply of the city shall be fluoridated by the addition of sufficient fluoride ion to raise the concentration of fluoride ion reaching each customer to an optimal level on one (1) part per million parts of water. The fluoride ion level shall be maintained between a minimum of eight-tenths (.8) part per million parts and a maximum of one and two-tenths (1.2) parts per million parts of water.

B. The city shall monitor fluoride ion levels in representative sample locations at least once per month

(Ord. #1955-4, §§1, 2; Code 1973, §35-8; SFCC 1981, §4-14-8; Ord. #1991-4, §6; Ord. #2003-25, §32)

25-1.9 Santa Fe River Watershed; Prohibited Uses; Posting of Notices.

A. Trespassing, bathing, hiking, camping, fishing, hunting, picnicking, the grazing of all domestic livestock and unauthorized shooting, within the Santa Fe watershed are forbidden.

B. The properties of the water reservoir system owned by and under the control of the city of Santa Fe and the U.S. Forest Service shall be posted with notices warning all persons against violation of any of the ordinances of the city and county of Santa Fe, of the laws of the state of New Mexico, the United States government or any rules or regulations adopted pursuant thereto, which provide for the protection of any reservoir, or properties of the water impounding system.

C. All officials and employees of the city water utility of the city of Santa Fe are hereby vested with authority to enforce all laws, orders, rulings and regulations enacted for the protection of these waters and the properties pertaining thereto.

D. Any violation of this subsection or any violation of the rules and regulations jointly agreed on by the U.S. Forest Service and the governing body shall be punished as provided in Section 1-3 SFCC 1987.

(Code 1953, §27-8; Code 1973, §35-9; SFCC 1981, §4-14-9; Ord. #1991-4, §7; Ord. #2003-25, §33)

25-1.10 Regulation of New Domestic Wells.

All domestic well applications within the city's municipal water service area, submitted to the New Mexico state engineer pursuant to Section 72-12-1 NMSA 1978, shall be governed by this section as authorized by Section 3-53-1 and Section 3-53-2 NMSA 1978.

A. The domestic well permit application shall be denied if the applicant's property boundary is within two hundred feet (200') of a water distribution main. Water service on said property shall be provided by the water utility.

B. For domestic well permit applications where the applicant's property boundary is greater than two hundred feet (200') from a water distribution main, the application shall be granted, provided that the following conditions are satisfied:

(1) The well shall be metered and monthly usage shall be recorded and reported annually to the water division.

(2) In certain parts of the water service area, as delineated by the division, the well shall be drilled a minimum of fifty feet (50') into the Tesuque formation and a seal constructed to prevent the mixing of water between the Tesuque and Ancha formations.

(3) The well shall be constructed to standards established by the city of Santa Fe and shall be drilled by a licensed well driller.

(4) The well owner shall agree to dedicate a ten to twenty foot (10' - 20') wide easement along the necessary property lines for the installation of future infrastructure.

(Ord. #1999-3, §1)

25-1.11 Inclusionary Zoning Ordinance Applicability.

The Inclusionary Zoning Ordinance as set forth in Section 14-8.11 SFCC 1987 shall apply to any application for residential developments located outside the city limits, which is requesting the extension of or connection to city water, submitted to the city after August 1, 1999, as may be limited by said ordinance and the city's jurisdiction. For the purpose of this section residential development shall be defined as set forth in Article 14-12 SFCC 1987. (Ord. #1999-42, §10; Ord. #2003-25, §34)

25-2 COMPREHENSIVE WATER CONSERVATION REQUIREMENTS.*

25-2.1 Short Title.

This section may be cited as the Comprehensive Water Conservation Requirements Ordinance. (Ord. #1997-17, §2)

25-2.2 Purpose.

The purpose of this section is to provide the city the means to reduce per capita water demands by requiring its citizens and businesses to comply with prescribed water conservation regulations and by establishing financial incentives for water conservation. (Ord. #1997-17, §3)

25-2.3 Scope.

There is established a city of Santa Fe comprehensive water conservation requirements ordinance that shall apply to all water whether potable or effluent, and all citizens, businesses, and governmental entities within the corporate limits of the city and all customers of the city water or wastewater utility wherever situated. Furthermore, all provisions of this chapter related to water surcharges, shall apply to all persons, customers, and property served by the city water utility wherever situated. (Ord. #1997-17, §4; Ord. #2001-34, §1)

25-2.4 Declaration of Policy.

A. The governing body finds and determines that encouraging and requiring the adoption of water conservation strategies is an effective and low cost means to balance water demands with limited available water supplies and production capabilities. The governing body further recognizes that as a consequence of implementing water conservation regulations, reduction in water use provides the following benefits to the city and its citizens:

(1) Potential for reduction of individual residential and commercial customers' water and sewer bills.

(2) Serves as a critical interim source of supply while additional supply sources are being brought on line.

(3) Reduces peak summer demands thereby reducing short and long-term system costs.

(4) Enhances the local environment by minimizing transport of fertilizer, pesticide, and other contaminants from runoff to surface waters and deep percolation to ground waters. Enhances the global environment by reducing energy consumption associated with water production, treatment, and distribution.

B. It is hereby declared, because of the city's immediate and long-term limited water supplies and the overall benefits of water conservation, that the city promote and require water use efficiency strategies for the public health, safety, and general welfare of its citizens.

(Ord. #1997-17, §5)

25-2.5 Conservation Signage and Literature Distribution.

A. Public, semi-public, and governmental entities shall post not less than one (1) water conservation sign in each restroom and shower facility, the size of which shall not be less than eight and one-half (8.5") inches by eleven (11") inches. Such entities may use a city-provided sign or develop their own sign using city-provided text, the text of which, shall cite this section. A "public facility" shall not include those facilities solely used by the entity's employees. A "semi-public facility" shall include all private clubs and fraternal organizations.

B. Hotels, motels, and other lodging facilities shall provide a water conservation informational card or brochure in a visible location in each guest room. Such facilities may use city-provided literature or develop their own using city-provided text. Lodging facilities shall not provide daily linen and towel changing for those guests staying multiple nights unless the guest specifically requests each day that the linen and towels be changed.

C. Retail plant nurseries shall provide their "end-use customers" with city-provided low water use landscape literature and water efficient irrigation guidelines at the time of sale of any outdoor perennial plants. An "end-use customer" is the person or persons who will ultimately own the plant material. A landscape contractor or architect is not an end-use customer. In order to facilitate the purchasing of low water use plants, nurseries are strongly encouraged to tag or sign their low water use plants that require little to no supplemental watering once established. For the sale of all turf or grass seed or sod, the customer shall be given city-provided literature indicating the restrictions to planting water consumptive turf, per Chapter XIV.

D. Landscape contractors, maintenance companies and architects shall provide their prospective clients with city-provided low water use landscape literature and water efficient irrigation guidelines at the time of presenting a service contract to the prospective client. Landscape professionals are strongly encouraged to educate their customers regarding the operation of their timed irrigation systems.

E. Title companies and others closing real estate transactions shall provide the entity purchasing a home, business, or property with city-provided indoor and outdoor conservation literature at the time of closing.

F. City departments shall provide indoor and outdoor conservation literature to:

(1) All persons applying for a building permit from the permit and development review division.

(2) All customers initiating new water service from the city water division.

(Ord. #1997-17, §6; Ord. #2001-34, §2)

25-2.6 Indoor Conservation.

A. Water system leaks from private water lines shall be repaired by the owner or property manager within fifteen (15) days of initial notification by the water utility. Proof of repair shall be provided to the water utility upon completion of the repair.

B. For all new and remodeling construction and all replacements of existing plumbing fixtures, the water conservation plumbing standards set out below shall be met. In addition, with the exception of item (4), all existing water users shall retrofit their facilities such that the plumbing fixtures noted below are in place by January 1, 2003. Single and multi-family residential water users are exempt from this retrofit requirement.

(1) Water closets. Water closets, either flush tank, flushometer tank, or flushometer valve operated, shall have an average consumption of not more than 1.6 gallons (6.1 liters) of water per flush. Water closets that use a "quick closing" flapper to limit the flush to 1.6 gallons per flush shall not be used to satisfy this requirement.

(2) Urinals. Urinals shall have an average water consumption of not more than 1.0 gallon (3.8 liters) of water per flush, with the exception that, if approved by the inspection and enforcement division, blowout urinals may be installed for public use in stadiums, race courses, fairgrounds, and other structures used for outdoor assembly and for similar uses.

(3) Non-metered faucets. Lavatory and kitchen faucets shall be equipped with aerators and shall be designed and manufactured so that they will not exceed a water flow rate of 2.5 gallons (9.5 liters) per minute.

(4) Metered faucets. Self-closing or self-closing metering faucets shall be installed on lavatories intended to serve the transient public, such as those in, but not limited to, service stations, train stations, airports, restaurants, and convention halls. Metered faucets shall deliver not more than 0.25 gallons (1.0 liters) of water per use.

(5) Shower heads. Shower heads shall be designed and manufactured so that they will not exceed a water supply flow rate of 2.5 gallons (9.5 liters) per minute. Emergency safety showers are exempted from this provision.

(6) Installation. Water-conserving fixtures shall be installed in strict accordance with the manufacturers' instructions to maintain their rated performance.

(7) Certificate of compliance. For all new and remodeling construction, all of the requirements regarding water conserving devices mentioned in subsections 25-2.6 B(1) SFCC 1987 through 25-2.6B(6) SFCC 1987 shall be certified by a certificate of compliance by a licensed mechanical contractor or plumbing permittee before or at the time of the final plumbing inspection.

(8) Authority to permit exceptions. The city building inspector and the city engineer have the authority to permit exceptions to subsections 25-2.6B(1) through 25-2.6B(7) SFCC 1987 in any case necessary to maintain adequate health and sanitation standards.

(9) Existing water users failing to retrofit their facilities by September 8, 2003, shall be subject to four (4) times the administrative fees set forth in subsection 25-1.4A(1) SFCC 1987. After a citation for failing to retrofit has been issued, the water user shall have sixty (60) days to obtain such retrofits. During that sixty (60) day period, no further citations shall be issued. After that sixty (60) day period, the water service shall be discontinued following notice as set forth in Exhibit A, Rule 9, paragraph D.3 of this chapter.*

C. *Eating Establishments.* All public and private eating establishments shall provide water or other beverages only upon request. Eating establishments serving beverages in single-serving containers shall only serve an accompanying glass if specifically requested by the customer. These provisions shall be clearly communicated to the customer in at least one of the following manners: on the menu, by use of a "table tent" or similar signage on the table, or posting in a location clearly visible to all customers. All catering and banquet operations shall comply with the provisions of this subsection.

(Ord. #1997-17, §7; Ord. #2001-34, §3; Ord. #2003-31, §1)

25-2.7 Outdoor Conservation.

A. *Outdoor Irrigating Periods.* The following requirements for outdoor irrigation of landscaping shall be in effect from May 1 through October 31 of each and every year. Outdoor irrigation is prohibited between 10:00 a.m. and 6:00 p.m. In addition, if water supply and demand conditions indicate a need to manage demands more aggressively in a given year, the water division director may institute "odd-even" irrigation restrictions. Odd-numbered addresses may irrigate only on Tuesdays, Thursdays, and Saturdays. Even-numbered addresses may irrigate only on Wednesdays, Fridays, and Sundays. It is emphasized that most landscaping can remain healthy and attractive with much less frequent irrigating than the three (3) day per week allowance. For a location lacking an identifiable odd or even-numbered address, the owner or managing agent shall select an odd-even schedule to which it chooses to adhere provided the city water utility is so notified. A large irrigation user may designate a portion of its landscape area as "odd" and a portion as "even" if active use of the landscaping and/or water pressure limitations constrain the owner's ability to irrigate the entire landscaped area in either an odd or even day, provided the city water utility is so notified.

B. *Exemptions:*

(1) Water sources and irrigation methods. The following sources of water and types of irrigation methods and applications are exempt from the three (3) day per week outdoor irrigating restriction in paragraph A should the division director institute such restrictions. These sources and irrigation methods are not exempt from the time of day irrigation restriction.

(a) Treated effluent ;

(b) Water harvested from precipitation;

(c) Grey water. Grey water is defined as household waste water other than from water closets and kitchen sinks;

(d) The irrigation of outdoor plants which are in movable containers.

(2) Newly installed turf sod and seed. If the water division director institutes the odd-even irrigation restrictions, newly installed turf sod and seed shall be exempt from three (3) day per week irrigation restriction in paragraph A, above, for a sixty (60) day period after its purchase or installation. New turf shall not be exempt from the time-of-day irrigation restriction in subsection A. Plant nurseries and landscape contractors shall attach a city-provided notification of the sixty (60) day exemption and subsequent requirement to comply with paragraph A to the bill of sale. Citizens shall retain the notification and bill of sale during the sixty (60) day exemption period as proof of the exemption. The exemption is for newly installed turf sod or seed only and not for other new or existing landscaping.

(3) Nursery stock. Plants being irrigated for retail or wholesale sale are exempt from paragraph A, above.

(4) Landscape maintenance and contracting companies. All manual watering by landscape maintenance and contracting companies are exempt from paragraph A, above. Landscape companies setting timed irrigation systems shall ensure that the systems comply with paragraph A.

(5) Public parks, public school athletic fields and public roadside landscapes. This provision is adopted in order to serve community needs for active and passive recreation deemed essential to the quality of life for persons of all ages and to protect tax paid investments in landscaped facilities. Maximum irrigation for turf and woody plant areas shall be based upon evapotranspiration (ET) replacement to maintain the health and vigor of the plants as follows:

	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Total
ET (in inches)	0.7	1.55	2.8	4.25	5.05	4.5	3	1.65	0.5	24

However, the city will use the information received from its weather stations to determine optimal watering levels which may be less than those listed in the chart above. Woody plant materials in roadside landscapes may be irrigated once a week. Roadside landscapes shall mean those located within the public right-of-way completed as part of a publicly funded project and maintained by the city. Public parks, public school athletic fields and roadside landscapes shall be reviewed and retrofitted to incorporate the most efficient available technology in irrigation and xeric plant selection. New turf areas in public parks may be installed as long as the overall total square footage of turf in public parks does not increase from that in existence at the time of adoption of this ordinance.* Existing turf may be renovated by sod or seeding.

C. *Authority to Permit Exceptions.* The city water director has the authority to permit exceptions to this subsection provided the water conservation objection is not compromised.

D. *Potable Water Use for Certain Construction and Landscaping Purposes.* For those construction and landscaping purposes permitted by the New Mexico environment department to use treated wastewater, potable water use from a fire hydrant is prohibited. Treated wastewater from the city's effluent fill station or other facility shall be used for such purposes.

(Ord. #1997-17, §8; Ord. #2001-34, §4;Ord. #2003-12, §1)

25-2.8 Water Conservation Surcharges.

The following water conservation surcharges, as an overlay onto the existing water rate structure, shall apply to water consumption beginning May 1 through October 31. Twenty-eight (28) to thirty-two (32) days shall be considered a "regular billing period". For billing periods that are less than twenty-eight (28) days or exceed thirty-two (32) days, the point at which the first and second level surcharges are in effect shall be decreased or increased, respectively, by a prorated amount, assuming thirty (30) days as a "normal billing period."

A. Residential service.

(1) First level surcharge. For all metered usage above twelve thousand (12,000) gallons per regular billing period, the surcharge shall be two dollars and fifty cents ($2.50) for every one thousand (1,000) gallons or portion thereof that is above twelve thousand (12,000) gallons. The first level surcharge shall terminate at a usage of twenty thousand (20,000) gallons per month.

(2) Second level surcharge. In addition to the surcharges levied by the first level surcharge, for all metered usage above twenty thousand (20,000) gallons per regular billing period, a surcharge of five dollars ($5.00) per one thousand (1,000) gallons for every one thousand (1,000) gallons or portion thereof used above twenty thousand (20,000) gallons shall be established.

B. Small and large commercial service. A surcharge of one dollar ($1.00) per one thousand (1,000) gallons or portion thereof on all metered water use is established.

(Ord. #1997-17, §9; Ord. #2001-26, §1; Ord. #2003-25, §35)

<u>25-2.9 Turf Restrictions.*</u>

A. Turf requirements for sports fields and golf courses shall comply as follows:

(1) Sports fields or golf courses created after August 25, 2003, shall not install turf grass sod or turf grass seed mixes.

(2) Sports fields or golf courses created prior to this date which have artificial turf shall not convert to natural turf.

(3) Sports fields or golf courses created prior to this date which have natural turf may be permitted to rehabilitate the natural turf if the area needing to be rehabilitated does not exceed seventy-five percent (75%) of the turf area. Rehabilitation of more than seventy-five percent (75%) shall not be permitted. Such turf areas in excess of seventy-five percent (75%) shall be replaced with artificial turf.

B. This section shall apply to all customers of the city water system except city owned sports fields or golf courses or to sports fields or golf courses which are part of a public or private preschool, elementary school, junior high school, high school, college or university.

C. As appropriate, violations of this section shall be considered a misdemeanor punishable as set forth in Section 1-3 SFCC 1987. In addition, the city may discontinue water service following a twenty-four (24) hour notice as set forth in Rule No. 9 of Exhibit A, Chapter XXV SFCC 1987* or pursue enforcement of these specific performance requirements in an appropriate court of law.

(Ord. #2003-28, §3)

25-2.10 Rainwater Harvesting Barrel Rebate Program.

A. *Legislative Findings.* The governing body has determined the following:

(1) The city has limited water resources especially in years of drought;

(2) The city of Santa Fe encourages the community to conserve water in various ways; and

(3) The community has shown a high interest in conserving water by using rain barrels.

B. The city shall provide rebates to purchasers of rainwater harvesting barrels provided the following are met:

(1) The purchaser shall be a customer of the city water system;

(2) The customer shall be solely responsible for purchase, installation and payments;

(3) The city does not warrant, endorse, or assume liability for the quality or performance of the product purchased;

(4) The rebate shall be credited to the customer's water bill within ninety (90) days of submission of the rebate certification form to the city;

(5) The rebate certification form along with the original receipt shall be returned to the city prior to the expiration date on the form;

(6) There is no limit on the number of barrels purchased; however the customer shall be limited to a one-time rebate of thirty dollars ($30.00) total;

(7) The customer shall agree to allow the city access to inspect the premises in order to verify installation;

(8) Rebates are available on a first come, first serve basis until all dedicated funds are expended;

(9) Rainwater harvesting barrels shall have a child/pet safety device to prevent children and pets from entering, an on/off valve and a removable debris screen; and

(10) Purchases and rebates for rainwater harvesting barrels shall comply with city program guidelines as adopted.

C. The total of all rebates shall not exceed the amount appropriated by the governing body each fiscal year.

D. The section shall become effective September 8, 2003.

(Ord. #2003-29, §1)

25-2.11 Other Water Conservation Programs.

The governing body may adopt other water conservation programs, including but not limited to, rebates or vouchers for water saving devices. Such programs shall be adopted by resolution and shall not exceed funds allocated by the governing body each fiscal year. No water user shall be eligible for both a rebate or voucher and a retrofit credit for any specific water saving device. (Ord. #2003-29, §2)

25-3 WATER WASTE.

25-3.1 Water Waste Prohibited.

No person, firm, corporation, county, state, federal, or municipal facility or operation shall cause or permit to occur any water waste, whether served by the city water utility or by a private well. In general the occurrence of an unforeseeable or unpreventable failure or malfunction of plumbing and irrigation system hardware shall not be deemed sufficient grounds for issuance of a citation or other enforcement proceedings unless and until the city issues a formal warning notice.

For unforeseeable or unpreventable outdoor violations, the city shall generally issue a formal warning notice prior to taking enforcement action. Prior to taking formal enforcement action the city may instruct the water user to not operate the faulty system until it is appropriately repaired. If operating the system is integral to the operation of the facility the city may in its discretion provide a period of time in which to remedy the violation prior to commencing formal enforcement action. Once a warning notice or an initial citation has been issued for an outdoor occurrence, subsequent water waste events shall be subject to strict enforcement. Strict enforcement may include the issuance of citations and such other actions as the city deems necessary to bring the water user into compliance. For indoor water waste events and for those water waste events outdoors caused by a faulty system which is integral to the operation of the facility, the waste must be abated within fifteen (15) calendar days of the issuance of a warning notice or initiation of enforcement action. Enforcement action shall be commenced if the waste continues to occur beyond the fifteen (15) day period. (Ord. #1991-4, §13; Ord. #2001-33, §4)

25-3.2 Fugitive Water Flow Prohibited.

No person, firm, corporation, county, state, federal, or municipal or other government facility or operation shall cause or permit the occurrence of fugitive water. (Ord. #1991-4, §13; Ord. #2001-33, §5)

25-3.3 Exemptions.

A. *"Water Waste"* shall not include:

(1) Flow resulting from firefighting or routine inspection of fire hydrants or from training activities.

(2) Water applied to abate spills of flammable or otherwise hazardous materials.

(3) Water applied to prevent or abate health, safety, or accident hazards when alternate methods are not available.

(4) Water which reaches or flows onto adjacent property or public or private right-of-way when caused by vandalism, wind, emergencies or acts of god.

(5) Flow resulting from a routine inspection or maintenance of the city water utility system.

(6) Water used by the city of Santa Fe in the installation, maintenance, repair or replacement of public facilities and structures including but not limited to traffic control devices, storm and sanitary sewer structures and road or street improvements.

(7) Water used by contractors or utilities including but not limited to sawcutting of pavement, compaction, or other use required under terms of their contract.

B. *"Fugitive Water"* shall not include:

(1) Storm run-off, including snowmelt run-off, allowed under provisions of Article VIII SFCC 1987 14-90.4.

(2) Flow resulting from temporary city water utility system failures or malfunctions.

(3) Water applied, such as in the cleaning of hard surfaces, to prevent or abate public health, safety, or accident hazards when alternate methods are not available. The washing of outdoor eating areas and sidewalks is not included in this exemption.

(4) Flow resulting from vandalism, high winds, emergencies, and acts of god.

(5) The occurrence of an unforeseeable or unpreventable failure or malfunction of plumbing or irrigation system hardware, prior to the issuance of a formal warning notice issued to the water user. Once a formal warning notice has been issued, the water user is instructed to not operate the faulty system until it is appropriately repaired, unless operating the system is integral to the operation of the facility. Once a warning notice has been issued, subsequent fugitive water events at the same location will be subject to issuance of citations.

(Ord. #1991-4, §13; Ord. #2001-33, §6)

25-3.4 Administration of the Chapter.

The city manager and/or designee shall be responsible for the enforcement of this chapter. It may prescribe policies, rules, or regulations to carry out the intent and purposes of the chapter.

A. On determination by city staff that a violation of the chapter exists, any responsible party shall be issued a verbal and/or written warning by the city to abate the nuisance immediately.

B. After notification should any responsible party fail to abate the nuisance for any reason after one (1) hour, that party shall be charged with violation of this chapter and may be found guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars ($500.). Each occasion this chapter is violated shall be considered a separate offense.

C. *Discontinuance of Water Service.* Upon verbal or written notification by city staff that a charge of violation of any of the provisions of this chapter has occurred and that the responsible party has failed to abate the nuisance after notification and charged of violation by the city for a misdemeanor pursuant to subsection 25-3.4 A and B, the city may discontinue service pursuant to its rules and regulations.

D. *Variances.* A variance may be issued by the governing body provided that all options for abatement through modified water management have been exhausted. The variance may be issued for a period of not to exceed one (1) year and shall stipulate both corrective measures and a schedule for completion.

(Ord. #1991-4, §13; Ord. #2003-25, §36)

25-3.5 Scope.

The preceding provisions on water waste and fugitive water shall apply to all water whether potable or effluent, and all citizens, businesses, and governmental entities within the corporate limits of the city and all customers of the city water or wastewater utility wherever situated.

(Ord. #2001-33, §7)

25-4 SANTA FE MUNICIPAL WATER SYSTEM.

The purpose of this section is to adopt rules and regulations and rates governing the operation of the Santa Fe municipal water system and providing for certain procedures with respect to the water system. (Ord. #1995-19, §1)

25-4.1 Rules and Regulations Adopted.

Rules and regulations governing water service by the Santa Fe municipal water system are hereby adopted by reference and incorporated as part of this chapter as Exhibit A.* (Ord. #1995-19, §1)

25-4.2 Rates and Charges Adopted.

Rates and charges related to water service by the Santa Fe municipal water system are hereby adopted by reference and incorporated as part of this chapter as Exhibit B.* (Ord. #1995-19, §1; Ord. #2000-01, §1; Ord. No. 2001-11, §1; Ord. #2002-24, §1))

25-4.3 - 25-4.9 Reserved.*

25-5 EMERGENCY WATER REGULATIONS.

25-5.1 Short Title.

This section may be cited as the Emergency Water Regulations Ordinance. (Ord. #1996-16, §1; Ord. #1996-20, §1; Ord. #2000-30, §1)

25-5.2 Purpose.

The purpose of this section is to provide the city the means to implement measures for controlling water use in response to water-system-related emergencies or catastrophic events that may disrupt systems operations. (Ord. #1996-16, §2; Ord. #1996-20, §2; Ord. #2000-30, §2)

25-5.3 Scope.

There is established a city of Santa Fe water emergency management plan that will apply to all customers of the city's water system. (Ord. #1996-16, §3; Ord. #1996-20, §3; Ord. #2000-30, §3)

25-5.4 Declaration of Policy.

A. The governing body, by and through its public utilities department, finds and determines that a water service emergency exists based upon the occurrence of one or more of the following conditions:

(1) A general water supply shortage due to increased demand or limited supply.

(2) Distribution or storage facilities of the city water utility are inadequate to meet demand or minimum quality standards.

(3) A disruption of the supply, storage, and distribution facilities of the city water utility occurs.

B. It is hereby declared that, because of the conditions prevailing in the city of Santa Fe, the general welfare requires that the city maximize the beneficial use of its available water resources to the extent to which it is capable, and that the waste or unreasonable use, and the conservation of such water is to be practiced with a view to the reasonable and beneficial use thereof in the interest of the citizens of the city of Santa Fe and for the public health, safety and welfare.

(Ord. #1996-16, §4; Ord. #1996-20, §4; Ord. #2000-30, §4)

25-5.5 Authorization.

A. The city manager is authorized to determine and declare that a water emergency exists in any and/or all parts of the city or county of Santa Fe that is served by the municipal water system, and upon such determination, to promulgate such regulations, rules, and conditions relative to the time of using water, the purpose or purposes for which it may be used and such other necessary limitations as will, in the city manager's opinion, relieve the water shortage in any such section or sections of the water service area.

B. The city manager, or the city manager's designee, following public notice, is hereby authorized and directed to implement the water emergency management plan through the applicable provisions of this section, upon the city manager's determination that such implementation is necessary to protect the public health, safety and welfare, under the following conditions.

(1) In the event of an unforeseeable disaster or water emergency such as an earthquake, or other catastrophic event affecting the Santa Fe river watershed, or groundwater supply, or other major disruption in the water supply, the governing body shall authorize the implementation plans for stages 3 and 4 of the emergency provisions of this section. Public notice will follow enactment of said provision.

(2) In the event of a foreseeable water emergency, such as extended drought conditions, the city manager, or the city manager's designee, shall be authorized to implement the applicable provisions of this section, upon public notice.

(Ord. #1996-16, §5; Ord. #1996-20, §5; Ord. #2000-30, §5)

25-5.6 Application.

The provisions of this section shall apply to all persons, customers and property served by the city water utility wherever situated. With the exception of drought emergency surcharges, these provisions shall also apply to all water users within the corporate limits of the city of Santa Fe including those on private domestic wells. (Ord. #1996-16, §6; Ord. #1996-20, §6; Ord. #2000-30, §6)

25-5.7 Water Emergency Management Stages.

No customer of the city of Santa Fe water utility shall make, cause, use, or permit the use of water from the city for residential, commercial, industrial, agricultural, governmental or any other purpose in a manner contrary to any provision of this section, or in an amount in excess of that use permitted by the following water emergency management stages which are in effect pursuant to action taken by the city manager, or the city manager's designee, or the governing body, in accordance with the provisions of this section. Stages 1 and 2 may be declared by the city manager or the city manager's designee. Stages 3 and 4 may be declared by the governing body. If the severity of the water emergency lessens, the city manager may downgrade the water shortage to a lower stage. The water use restrictions, drought emergency surcharges, and fines of each stage apply to all higher level stages, unless the higher stage has a more stringent requirement. At no time shall water be wasted or used unreasonably.

A. Unreasonable uses of water shall include but are not limited to the following practices:

(1) A customer shall not let water leave the customer's property by drainage onto adjacent properties or public or private roadways or streets due to excessive irrigation and/or uncorrected leaks.

(2) A customer will not fail to repair a water leak upon initial notification.

(3) A customer will not use water to wash down sidewalks, driveways, parking areas, tennis courts, patios or other paved areas, except to alleviate immediate safety or sanitation hazards.

B. *Stage 1. Voluntary Compliance—Water Watch.* Stage 1 applies during periods when the possibility exists that the city of Santa Fe water utility will not be able to meet all of the water demands of its customers by up to fifteen percent (15%) of the annual demand projection. All elements of Stage 2 and 3 shall, during Stage 1, apply on a voluntary basis only.

C. Stage 2. Mandatory Compliance-Water Alert. Stage 2 applies during periods when the probability exists that the city of Santa Fe water utility will not be able to meet from sixteen percent (16%) to thirty-five percent (35%) of the water demands of its customers. The stage 2 implementation plan is incorporated into Chapter 25 SFCC 1987 as Exhibit "C," Amended May 28, 2003. *

D. *Stage 3. Mandatory Compliance—Water Warning.* Stage 3 applies during periods when the city of Santa Fe water utility will not be able to meet from thirty-six percent (36%) to fifty percent (50%) of the water demands of its customers. The stage 3 implementation plan is incorporated into Chapter 25 SFCC 1987 as Exhibit "D," Amended May 28, 2003*

E. *Stage 4. Mandatory Compliance—Water Emergency.* Stage 4 applies when a major failure of any supply or distribution facility, whether temporary or permanent, occurs in the water distribution system of the federal, state or other water authorities, or the city water utility, upon which supply of water the municipal water system relies. In addition, if these or other factors lead to a probable shortage in excess of fifty percent (50%) of anticipated demand, the stage 4 implementation plan will be activated. Upon implementation by the governing body and publication of notice, the following measures shall apply when potable water is used:

(1) All outdoor irrigation of turf and ground cover is prohibited with the exception of plant materials classified to be rare, exceptionally valuable or essential to the well being of the public at large or rare animals. Irrigation of trees and shrubs is permitted only by hand-held hose equipped with a positive shut-off nozzle, hand-held container or drip irrigation system. The above restrictions do not apply to public parks, public school athletic fields, and roadside landscapes which shall reduce irrigation permitted in subsection 25-2.7B(5) SFCC 1987 by 35%.

(2) The use of water at commercial nurseries, commercial sod farms and similarly situated establishments shall be reduced in volume by an amount determined through approval of the stage 4 implementation plan by the governing body.

(3) The washing of automobiles, trucks, trailers, boats, airplanes and other types of mobile equipment is prohibited. The use of water by all types of commercial car washes or commercial vehicle service stations and not in the immediate interest of the public health, safety and welfare shall be reduced in volume by an amount determined through approval of the stage 4 implementation plan by the governing body. Further, such washings are exempt from these regulations where the health, safety and welfare of the public is contingent upon frequent vehicle cleanings such as refuse collection trucks and vehicles used to transport food and perishables.

(4) The filling, refilling or adding of water to swimming pools, spas, ponds and artificial lakes is prohibited except where this use is storage for a water supply.

(5) The watering of all golf course areas is prohibited.

(6) Use of water from fire hydrants shall be limited to fire fighting or other activities immediately necessary to maintain the health, safety and welfare of the citizens served by the municipal system.

(7) All restaurants are prohibited from serving water to their customers except when specifically requested by the customers.

(8) Water shall not be used to wash down sidewalks, driveways, parking areas, tennis courts, patios or other paved areas, except to alleviate immediate fire or sanitation hazards.

(9) The operation of any ornamental fountain or similar structure is prohibited except for short periods of time to prevent damage.

(10) The use of water for commercial, manufacturing or processing purposes shall be reduced in volume by an amount determined through approval of the stage 4 implementation plan by the governing body.

(11) All sales of potable water outside of the water service area shall be discontinued, with the exception of sales previously approved by the governing body.

(12) No new construction meters will be issued. Construction water shall not be used for earth work or road construction purposes. Construction projects necessary to maintaining the health, safety and welfare of the public are exempt from these regulations.

(13) Except for property for which a building permit has been issued, no new building permit(s) shall be provided, except in the following circumstances:

(a) For projects necessary to protect the public's health, safety, and welfare;

(b) When using reclaimed water;

(c) When the recipient of the building permit can demonstrate that no net increase in water use will occur; or

(d) Where the recipient of the building permit provides a conservation offset.

(14) Stage 4 will be terminated by the governing body.

(Ord. #1996-16, §7; Ord. #1996-20, §7; Ord. #2000-30, §7; Ord. #2000-40, §1; Ord. No. 2002-17, §1; Ord. #2003-12, §2)

25-5.8 Mandatory Conservation Phase Implementation.

The city water utility shall monitor the projected supply and demand for water by its customers on a daily basis during periods of emergency or drought and shall recommend to the city manager the extent of the conservation required through the implementation and/or termination of particular conservation stages, to prudently plan and supply water to its customers. Thereafter, the city manager may order the implementation or termination of the appropriate phase of water conservation in accordance with the applicable provisions of this section. The declaration of any stage beyond stage 1 shall be made by public announcement and shall be published a minimum of one (1) time for three (3) consecutive days in a daily newspaper of general circulation. The stage designated shall become effective immediately upon announcement. (Ord. #1996-16, §8; Ord. #1996-20, §8; Ord. #2000-30, §8)

25-5.9 Penalty.

It shall be unlawful for any person, corporation or association to violate the provisions of this section. Unless otherwise stipulated, violations of these provisions shall be a misdemeanor subject to penalties provided in Section 1-3 SFCC 1987. The public utilities department may alternatively seek injunctive relief in the district court. In addition to any other remedies which the public utilities department may have for the enforcement of this section, service of water may be discontinued or appropriately limited to any customer who willfully uses water in violation of any provisions thereof. (Ord. #1996-16, §9; Ord. #1996-20, §9; Ord. #2000-30, §9)

25-5.10 Severability.

If any provision, section, subsection, sentence, clause or phrase of this section, or the application of same to any person or set of circumstances is, for any reason, held to be unconstitutional, void, or invalid, the invalidity of the remaining portions of this section shall not be affected, it being the intent of the governing body in adopting this section that no portions, provisions, or regulations contained herein shall become inoperative, or fail by reason of the unconstitutionality of any other provision hereof, and all provisions of this section are declared to be severable for that purpose. (Ord. #1996-16, §10; Ord. #1996-20, §10; Ord. #2000-30, §10)

25-5.11 Emergency Water Regulations; Publication of Terms of Water Use.

Upon such emergency declaration by the governing body, it shall be the duty of the administration to give public notice by publishing a notice giving the extent, terms and conditions respecting the use and consumption of water, at least once in a newspaper of general circulation in Santa Fe; that upon such declaration and publication of such notice due and proper notice shall be deemed to have been given each and every consumer supplied with water by the municipal water system. (Ord. #1996-16, §11; Ord. #1996-20, §11; Ord. #2000-30, §11)

25-5.12 Reserved.*

25-5.13 Regulation of Domestic Wells.

All domestic wells within the jurisdiction of the city of Santa Fe shall be governed by this section as authorized by §§3-53-1 and 3-53-2 NMSA 1978. (Ord. #1996-20, §13; Ord. #2000-30, §13)

25-5.14 Reserved*

25-6 RESERVED.**

CITY OF SANTA FE - PUBLIC UTILITIES DEPARTMENT
WATER SERVICES DIVISION
RATE SCHEDULE 10 CONSERVATION PROGRAM CHARGE

APPLICABILITY: In addition to the charges set forth in rate schedules 1, 2 and 3, all residential, and small or large commercial water service customers shall pay a twice-yearly conservation program charge. The charge shall be included in the customers' April and November water bills. The revenue collected shall be specifically set aside to pay for materials and direct costs associated with the city's conservation program, excluding general administration. Programs to be funded shall directly benefit residential or commercial consumers and result in water demand reduction. The charge shall cease on June 30, 2004 unless extended by the governing body at a public hearing prior to said date.

SERVICE AREA: Within the corporate limits of the city of Santa Fe, New Mexico and those areas outside the corporate limits to which service had been authorized by action of the governing body of the city of Santa Fe.

RATE: The charge for the conservation program shall be the following:

Residential Fee

Meter Size	Conservation Fee
All meters	$5.00

Commercial Fee

Meter Size	Conservation Fee
5/8"	$5.00
3/4"	$7.50
1"	$12.50
1.5"	$25.00
2"	$40.00
3"	$78.00
4"	$125.00
6"	$250.00
8"	$400.00

TERMS OF PAYMENT: The charge set forth above is payable within twenty (20) days from date of bill.

Adopted: May 29, 1996
Amended: June 13, 1996
Amended: July 31, 1996
Amended: September 11, 1996
Amended: June 28, 2000
Amended: April 10, 2002
Amended: May 28, 2003

CITY OF SANTA FE
EMERGENCY WATER REGULATIONS
WATER EMERGENCY MANAGEMENT PLAN
EXHIBIT C STAGE 2 IMPLEMENTATION PLAN
(Subsection 25-5.7 C)

1. **LANDSCAPE IRRIGATION RESTRICTIONS.** Once Stage 2 or a higher stage is declared, any requirements to plant new landscaping under Chapter XIV associated with new construction shall be held in abeyance until all water shortage stages are rescinded. The property owner or developer shall post a bond sufficient to cover the costs of installing the required landscaping.

The following shall apply to all forms of outdoor irrigation using potable water:

a. The planting of all new turf seed and sod is prohibited. The planting of all other new in-ground landscaping and outdoor containerized landscaping is strongly discouraged.

b. **Times and Days of Irrigation:** The odd-even address three (3) day per week watering schedule identified in subsection 25-2.7A. shall be in effect. Newly installed turf seed and sod sixty (60) day exemptions granted prior to the declaration of Stage 2 under subsection 25-2.7B(2) shall remain valid. No new exemptions shall be granted. Outdoor plants in above ground containers movable by hand shall be exempt from these restrictions. Plant nurseries are exempt from the watering restrictions. Landscape maintenance companies doing manual watering are exempt from the time of day and day of week watering restrictions but must not manually irrigate their clients' landscaping more than three (3) days a week. For those customers of landscape companies that have automatic irrigation controllers, the odd-even address watering days and times must be complied with.

c. **Public Parks, Public School Athletic Fields, and Roadside Landscapes:** The above restrictions shall not apply; however, irrigation restrictions set forth in subsection 25-2.7B(5) SFCC 1987 shall apply.

2. **OUTDOOR USE RESTRICTIONS.**

a. Allowing water to run beyond a property owner's boundary is prohibited.

b. Using water to clean hard surfaces such as tennis courts, sidewalks, and driveways is prohibited unless there is a public health or safety hazard. A violation occurs even if water does not leave the property owner's boundary.

c. **Swimming Pools/Spas:** One initial filling is allowed for recirculating pools. Non-recirculating pools may not be filled or refilled.

d. **Ornamental Fountains:** Non-recirculating fountains are prohibited.

e. **Vehicle Washing:** All vehicle washing at residences is prohibited. All vehicle washing is limited to once-per month at commercial car wash facilities, including do-it-yourself car wash facilities. Commercial car sale lots and other commercial and governmental entities with on-site vehicle washing facilities are limited to washing their vehicles one time per month during the first full week of the month, unless there is a demonstrated public health or safety reason for more frequent washings.

3. **INDOOR USE RESTRICTIONS AND PUBLIC NOTICING REQUIREMENTS.**

a. **Posting of Water Shortage Bulletin:** Excluding residential facilities, owners of restrooms, showers, and locker facilities shall post a city-provided 8.5 by 11 inch water shortage announcement in the restroom, shower, and locker room areas. This provision applies to all private, public, governmental, and commercial establishments. In addition to restroom signs, all indoor commercial establishments shall post the same announcement in a location clearly visible to their customers.

b. **Low Flow Shower Heads and Faucet Aerators:** All commercial entities shall have the following installed within two weeks of the effective date of the Stage 2 declaration: (1) Shower heads with a flow rate not to exceed two and one-half (2.5) gallons per minute. Emergency safety showers are exempt from this provision. (2) Lavatory and kitchen faucets shall be equipped with aerators so that they will not exceed a water flow rate of two and one-half (2.5) gallons per minute.

4. **DROUGHT EMERGENCY SURCHARGES.** The following Drought Emergency Surcharges shall be applied to water bills for all customers served by Sangre de Cristo Water. Surcharges shall become effective with the first beginning meter read following the Stage 2 effective date. Surcharges shall remain in effect through an entire monthly billing process, even if Stage 2 is rescinded on an earlier date. Surcharges shall not be assessed for estimated bills. Rule #22, Customer Complaint Procedures, under subsection 25-4.1, shall be used for customers desiring to appeal their Drought Emergency Surcharges or their Water Use Violation Fees under Section 5 below. Surcharges shall be adjusted accordingly for partial month or multiple month bills.

a. **Residential Customers:** $15.00 per one thousand gallons for all usage above 10,000 gallons per month up to 20,000 gallons per month. $25.00 per one thousand gallons for all usage above 20,000 gallons.

b. **Small and Large Commercial Customers:** $2.00 per one thousand gallons on all usage.

5. **ENFORCEMENT AND ADMINISTRATIVE FEES FOR VIOLATING WATER USE RESTRICTIONS.** The enforcement modes and administration fees identified in Subsection 25-1.4 shall apply to this and each higher level water emergency stage.

Amended: September 13, 2000

Amended: April 10, 2002

Amended: May 28, 2003

CITY OF SANTA FE
EMERGENCY WATER REGULATIONS
WATER EMERGENCY MANAGEMENT PLAN
EXHIBIT D STAGE 3 IMPLEMENTATION PLAN
(Subsection 25-5.7 D)

1. **LANDSCAPE IRRIGATION RESTRICTIONS.** The following shall apply to all forms of outdoor irrigation using potable water.

a. Except for turf seed and sod, the planting of landscaping is permitted. All plant nurseries or landscape professionals or community gardens shall provide their customers at the time of sale or service contract, literature, the text of which is provided by the city, indicating that the city is under once per week watering restrictions, that the new plantings must comply with those restrictions, and that they are subject to administrative fee assessments if they don't comply with those restrictions.

b. **Times and Days of Irrigation:** Outdoor watering of landscaping is limited to once per week. Odd-numbered addresses may water on Tuesdays. Even-numbered addresses may water on Fridays. Newly installed turf seed and sod exemptions granted prior to the declaration of Stage 3 under subsection 25-2.7B(2) are no longer valid. No new exemptions shall be granted. Outdoor plants in above ground containers movable by hand shall be exempt from these restrictions. Plant nurseries are exempt from the watering restrictions. Landscape maintenance companies doing manual watering are exempt from the time of day and day of week watering restrictions but shall not manually irrigate their clients' landscaping more than one day per week. For those customers of landscape companies that have automatic irrigation controllers, the odd-even address watering day and times noted above must be complied with.

c. **Public Parks, Public School Athletic Fields, and Roadside Landscapes:** The above restrictions shall not apply; however, irrigation permitted in subsection 25-2.7B(5) SFCC 1987 shall be reduced by 15%.

2. **OUTDOOR USE RESTRICTIONS**.

a. **Swimming Pools/Spas:** Swimming pools without pool covers are prohibited. All pools must be covered when not in use. The filling and refilling of swimming pools or spas at a single family residences is prohibited.

b. **Ornamental Fountains:** The use of all ornamental fountains is prohibited.

3. **INDOOR USE RESTRICTIONS.**

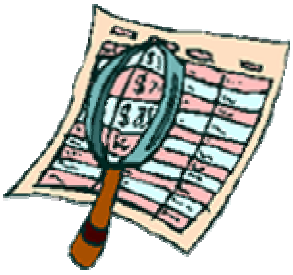
a. Lodging Facilities: Lodging facilities shall not change the sheets and towels more than once every four (4) days for guests staying more than one night unless there is a justified public health reason. Guests shall be informed of this requirement in writing at the time of check-in.

4. **CONSTRUCTION USE RESTRICTIONS**.

a. If the effluent fill station is permitted by the State and effluent is available, potable water for construction purposes through a metered hydrant is prohibited.

5. **FEES FOR VIOLATING WATER USE RESTRICTIONS.** The fees for violating Sections 1, 2, 3 and 4 above shall be the same as those stipulated in Section 5 of the Stage 2 Implementation Plan (Exhibit C).

US Environmental Protection Agency



About Water & Wastewater Pricing

Prices signal value to consumers and help determine whether consumers use water efficiently. If prices are too low, consumers will use too much water. Economists have long advocated the "polluter pays" principle - the idea that the polluter or consumer should pay for any environmental damage or resource depletion created. While this principle is generally accepted in the classroom, its application in the real world is much harder to find.

Full cost pricing is usually interpreted to mean factoring all costs - past and future, operations, maintenance and capital costs - into prices. Full cost pricing can take the form of any of the rate structures below so long as all costs are recovered through prices.

Types of Pricing Structures

A large portion of our water and wastewater providers are publicly-owned natural monopolies. As such, water and wastewater finances can be intermingled with other municipal departments so that revenues and costs are shared with other municipal functions. Local governments and state laws can also constrain a publicly-owned utility's rate setting. Current water and wastewater prices may not cover the full and complete costs of past and future capital and operating costs.

Several price structures are available for water and wastewater providers seeking to encourage conservation.

- **Increasing block rates.** Increasing block rates or tiered pricing reduces water use by increasing the per-unit charges for water as the amount used increases. The first block is charged at one rate, the next block is charged at a higher rate, and so forth.
- **Time of day pricing.** Higher prices are charged during a utility's peak demand periods.
- **Water surcharges.** A higher rate is imposed on "excessive" water use, i.e., water consumption that is considered higher than average.
- **Seasonal rates.** Prices rise and fall according to water demands and weather conditions (with higher prices usually occurring in the summer months).

There are also other rate structures that are currently used by water and wastewater providers; however, these types of rate structures are not as effective in encouraging conservation.

- **Uniform rate structures.** A uniform rate charges the same price per unit for water usage beyond the fixed customer charge, which covers some fixed costs. The rate sends a price signal to the customer, because the water bill will vary by usage. Uniform rates by class charge the same price per unit for all customers within a customer class (e.g., residential or non-residential).
- **Flat fee rates.** Flat fee rates do not vary by customer characteristics or water usage.

EPA has produced numerous documents on pricing and the relationship between pricing and water conservation for water and wastewater systems.

Visit the Office of Water Online Publications

Appendix G

Ground Water Protection Plan

for

VILLAGE OF HOUSE

New Mexico Rural Water Association
3413 Carlisle Boulevard NE
Albuquerque, NM 87110

505-884-1031
1-800-819-9893
Fax: 505-884-1032

Village of House Well Head Protection Plan

Village of House

P.O. BOX 682
HOUSE, NM 88121-0682
(505) 279-7372
(505) 279-6053 FAX

Mr. Chris Campbell
N.M. Rural Water Association
3413 Carlisle Blvd. NE
Albuquerque, N. M. 87110

Re: Wellhead Protection Plan

Dear Mr. Campbell:

The Village of House is implementing a wellhead protection plan with public notices being posted and informational flyers sent to customers. Public discussions take place at the Senior Citizens Meal Center and regular village council meetings which are open to the public.

We are submitting our plan for review and approval

Sincerely,

Sherman W. Martin
Mayor

SWM/ll

NEW MEXICO RURAL WATER ASSOCIATION

Wellhead Protection Plan Form

SYSTEM: VILLAGE OF HOUSE WATER ASSOCIATION
WELL(S): Village Well

CONTACTS Sherman Martin
DATE: 10/31/97

A. WHPA MAINTENANCE

a. General Operation

Please describe the well field equipment and provide photographs of the well field and other aspects of the system to be highlighted.

The Village of House's well is located at the northwest corner of the Village Park in a locked wellhouse. The total depth to ground water is 103' with a static level of 52' and a pumping rate of 45 GPM. Water is distributed BY 4" lines to a 72,000-gallon storage tank located approx. 1800' from the well and then distributed to 34 connections serving a population of 69

b. Staff Training

How does your system provide staff training for WHP?

Sherman Martin is an active Board member of NMRWA and attends Rural Water training sessions on wellhead protection: he has also attended NMED trainings.

What methods are used to ensure that staff knowledge of WHP is kept current?

House is a member of NMRWA and subscribes to all Rural Water publications.

c. Drinking Water Quality Sampling Strategy

Describe any ground water source sampling strategy.

House submits monthly coliform bacteria samples: NMED conducts VOC, SOC, nitrate and metals testing every 3-6 years.

B. ADMINISTRATIVE MANAGEMENT

a. Linking WHPP with other State and Federal Ground Water Programs

Describe how you have linked your WHP activities with other Federal and State programs.

House has received grants in the past for the construction and maintenance of their water system from NMDFA and has paid off a $12,000 loan from NMED. Monthly bacteria and other sampling is coordinated with NMED.

b. Compliance with State and Federal Regulations

During the past two years, has your program had any State or Federal drinking water violations? If so, please describe

In 1996, one bacteria sample was in violation; a re-sample was conducted and the result was within the limits.

c. Emergency Response

Describe your plan to supply customers with safe drinking water in the event of a natural or man-made disaster.

The storage tank is capable of holding 6-days worth of water; an older well located at the Community Center will be utilized as a back-up supply.

Describe how the public is informed in the case of an emergency.

The small population of 69 can easily be informed door-to-door and through announcements at the Community Center's daily lunches.

If your system has participated in an emergency response drill, please describe the role the system played in the drill.

N/A

C. CUSTOMER SERVICE/OUTREACH PROGRAM

a. Formation of a Local WHP Task Force

Does your system have a WHPP task force? If so, who serves on it and what roles do they play in implementing the WHPP?

Sherman Martin, Mayor and Water Operator

- conducted source inventory/presentations on WHP/liaison with School Dept./ ordered and installed WHP sign

Linda Lavender, Village Clerk

- provided flyers for billings, postings

Chris Campbell, NMRWA

- conducted source inventory/coordinated plan preparation with Village/ submitted plan to NMED

b. Education of the Public

Describe the process used for public education and public participation, including notices and opportunity for public involvement in the WHPP.

The Planning Team has issued flyers in the water bill mailings, posted notices and made presentations on WHP at daily lunches at the Community Center and promoted wellhead protection in the House Municipal School's science curriculum.

Have you erected WHP signs? If so, please include photographs and describe any benefits you have experienced.

A sign has been posted at the wellhouse.

D. WELLHEAD PROTECTION AREA

a. Ground Water Supply Source

Provide a brief description of the aquifer and a page-size copy of a map showing the delineated WHP area. Also, please describe the location of the aquifer recharge area.

The House well draws its water from the Ogallala aquifer at a depth of 103'. NMED's Vulnerability Assessment, conducted 2/97 by James Edwards, calculates a capture zone and recharge area extending approx. 1700' north/northwest from the well with GW velocity of approx. 120 ft/yr.

b. Delineation of WHPA for Each Well or Well Field

Describe the method used to delineate the WHPA(s), who performed the delineation and any local involvement.

NMED VA Specialist Jim Edwards, conducted the Vulnerability Assessment in February 1997; a DRASTIC Index and a 10-year capture zone was calculated at that time. Using the information and calculations from this VA, Sherman Martin and Chris Campbell conducted the WHP delineation on 10/31/97.

c. Plans for Future Expansion of the Well Field

Describe how the WHP program will be used in expanding the well field and/or alternate drinking water supply source.

The Village's water system is sufficient for their current needs. However, if additional wells are ever required, they would be located in fields north of the village.

E. POLLUTION PREVENTION PROGRAM

a. Contamination Source Inventory

Describe the number and types of contaminant sources identified within the WHPA. How is the inventory maintained and updated? What was your role in conducting the inventory?

The capture zone, as determined in the VA, was surveyed and revealed numerous septic systems in the WHPA. Just beyond the WHPA is the House Municipal School's system which is the largest user of water in the Village; therefore, it is included in this plan. 3 USTs across the street from the wellhouse (noted in the VA) had been removed many years ago, according to Mr. Martin; these empty tanks are now stored above ground.

NMED will conduct follow-up inspections of the system at the end of the waiver period to determine any changes in the situation and to renew sampling waivers.

b. Management Program

Describe the management plan that has been developed for the WHPA to protect your well(s) from contamination. Include any ordinances, zoning controls, public education activities, signposting, well plugging and special agreements with landowners, businesses or state agencies.

The Planning Team has proposed a septic system maintenance program for the Municipal School (see attached letter) which will call for pumping out the school's system annually. Public education efforts will include the distribution of NMED information on septic system maintenance (in both English and Spanish) at Community Center lunches and through water bill mailings. The science teacher at the Municipal School will be encouraged to include WHP in the science curriculum and for students' science fair projects. An article on WHP will also appear in the School newspaper. In addition, the Team has posted a WHP sign at the wellhouse.

F. OTHER CONSIDERATIONS

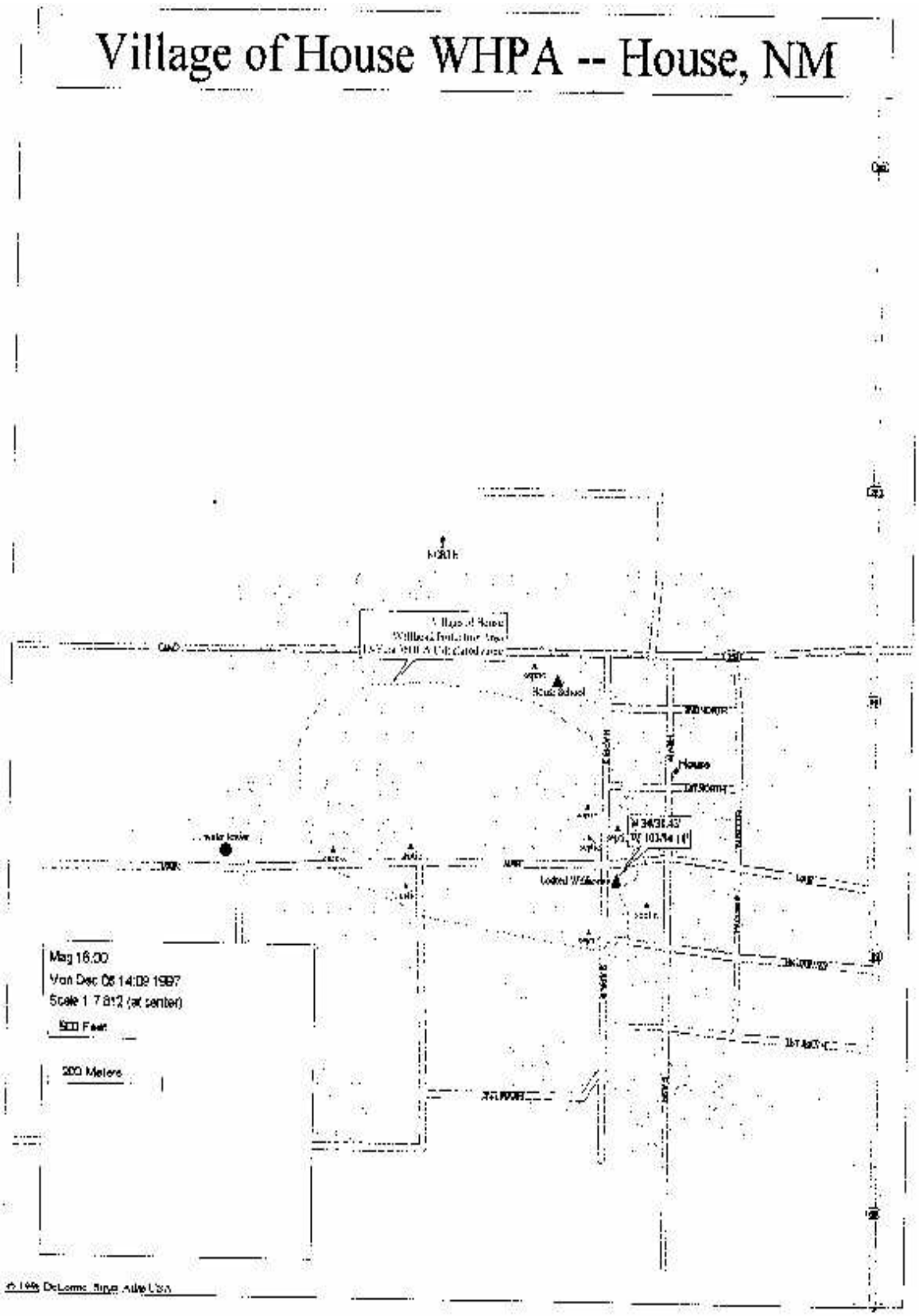
The enthusiasm and cooperation by the community in establishing the WHP program will be considered as a factor in approving your program and recognizing it for awards. Comments regarding these criteria should be included here.

All Village officials have cooperated enthusiastically in the review of the NMED Vulnerability Assessment and the NMRWA's efforts toward a Wellhead Protection Plan.

Also, please describe any other ways your WHP program will contribute to protection of the local water supply well(s).

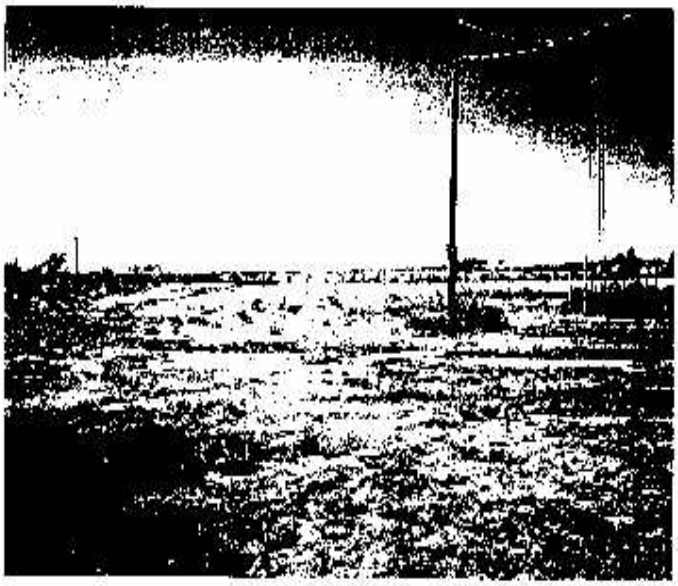
House may explore financial assistance for the improvement of septic systems within the WHPA.

Village of House WHPA -- House, NM



VILLAGE OF HOUSE
WELLHEAD PROTECTION PLAN

Wellhead and Pump House with Fire Dept. and Community Center, facing St



Wellhead Protection Area with Water Tower, facing west

VILLAGE OF HOUSE
WELLHEAD PROTECTION PLAN

School's Septic Tank and Leach Field, facing east

Former USTs removed and currently unused

Protect our underground Water

Village of House Wellhead Protection Program

The Village of House Wellhead Protection is designed to protect our good water from contamination. Contamination of water can come from pesticides, fertilizer. herbicides, oil products, improperly designed or improperly maintained septic systems, or other chemical spills.

If you see anything out of the ordinary with in 1000 feet of the village well, PLEASE call the Village Hall 279-7372, or Sherman Martin 279-6186.

For more information contact the Village Hall 279-7372.

YOU ARE NOW ENTERING

VILLAGE OF HOUSE

Quality On Tap!

WELLHEAD PROTECTION AREA

For Information Call: 279-7372

State of New Mexico
ENVIRONMENT DEPARTMENT
District IV
1216 Mechem Dr.
Ruidoso, New Mexico 88345
(505) 258-3272

GARY E. JOHNSON
GOVERNOR

MARY E. WEIDLER
SECRETARY

EDGAR T. THORNTON, III
DEPUTY SECRETARY

September 29, 1997

Mr. Sherman Martin, Mayor
Village of House
P O Box 682
House, NM 88121

Dear Mayor Martin:

To help ensure the safety of drinking water supplied to the citizens of New Mexico, the New Mexico Environment Department has implemented a sampling, waiver, and vulnerability assessment program, funded by the Water Conservation Fee. I am responsible for vulnerability assessments and waiver eligibility determination for public water system (PWS) sources in your area.

A vulnerability assessment includes the calculation of a DRASTIC index (for groundwater sources) or WRASTIC index (for surface water sources), which indicates the relative vulnerability of the water system to contamination. An explanation of the DRASTIC index is enclosed.

The following steps also are included in a vulnerability assessment: delineating protection areas around each source (using geohydrological modeling where sufficient aquifer data are available) and determining whether any potential contamination sources are located within those protection areas.

I have completed a vulnerability assessment of your PWS sources. The results of the vulnerability assessment are described in the enclosed summary, which includes copies of DRASTIC index worksheets, and a map showing the location of your well and associated wellhead protection area (WHPAs). The WHPAs were determined with the WHPA2 model, using the well and aquifer data shown on the accompanying WHPA worksheets. The data were obtained from published documents, well logs, and sanitary surveys of the wells in your system. The diagrams represent the 10-year capture zone around the well, with the boundaries of the 9-year, 6-year, and 3-year capture zones indicated also.

Mr. Sherman Martin
September 29, 1997
Page 2

The amount of nitrate may be somewhat elevated in water samples from the town well. Possible sources include nearly thirty liquid waste disposal systems discharging into the ground within a 1000-foot radius of the well (see enclosed list and diagram). As shown on the map, there are a few additional buildings with septic tank systems within the 9 and 10-year WHPAs to the northwest of the well.

At this time there are no apparent sources of pesticides or other synthetic organic compounds (SOCs) within the WHPAs, so sampling waivers for those contaminants have been issued. Because there is an abandoned gas station within 100 feet of the well (see map), a sampling waiver has been denied for volatile organic compounds (VOCs). Copies of the waiver applications are enclosed, along with a list of the organic chemicals included within the test method groups to which the applications refer.

Every PWS should have a source protection program to help ensure the production of safe drinking water. You may use the information provided in this vulnerability assessment to develop your wellhead protection program. I am enclosing a brochure which describes the basic steps involved in developing a wellhead protection program. For more information, please contact Darren Padilla or Cipriano Martinez in the Drinking Water and Community Services Bureau in Santa Fe. Their telephone number is: (505) 827-7536. Or, you may contact Christopher Campbell, Groundwater Technician with the New Mexico Rural Water Association in Albuquerque. His toll-free telephone number is 800-819-9893.

I hope the information provided in this vulnerability assessment of your PWS will assist you in your effort to protect your drinking water supply. Please call me in Ruidoso, (505) 256-3272, if you have any questions about the vulnerability assessment.

Sincerely,

James W. Edwards
Environmental Specialist

enclosures

cc: Garrison McCaslin, District Manager
John Hoover, Health Program Manager 1
Art Mason, Environmental Engineer
Darren Padilla, Geologist 1
David Tarner, Health Program Manager 1
Edwin E. Tucker, Environmentalist
Chris Campbell, Groundwater Technician, NMRWA

D R A S T I C I N D E X C O M P U T A T I O N

02-28-1997

The DRASTIC Index for Village of House is 119

The hydrologic factors which contribute to the DRASTIC Index indicate that the system could be vulnerable to pollution. (NOTE: This is not based upon any chemical evidence of pollution.)

The DRASTIC Pesticide Index for Village of House is 118

The hydrologic factors which contribute to the DRASTIC Index indicate that the system could be vulnerable to pollution. (NOTE: This is not based upon any chemical evidence of pollution.)

The hydrologic factors involved in this computation were:

1. The Depth to Water is listed as 52 feet.

2. The Net Areal Recharge is listed as .5 inches.

3. The Aquifer media is listed as:
   Sand and Gravel

4. The Surface Soil type in the area is listed as:
   Clay Loam

5. The General Topography (ground slope) for the area is listed as:
   . percent

6. The Vadose Zone Impact (Material type) is listed as:
   Sand and Gravel

7. The Hydraulic Conductivity is listed as 446.8 GPD/FT

DRASTIC Program Input Parameter Worksheet

DATE: 02/28/97

PARAMETER	BASE VALUE / DESCRIPTION	DRASTIC RATING	SOURCE(S)
Public Water System Name	Village of House	N/A	Field Office - NMED
Public Water System ID Number (WSS#)	102-20	N/A	Field Office - NMED
Depth to Water Units = Feet	52	3	U.S. Geological Survey State Engineer's Office Local Well Drillers
Net Recharge Units = Inches	0.5 in	1	U.S. Geological Survey State Engineer's Office
Aquifer Media	Sand & gravel	8	U.S. Geological Survey State Engineer's Office Local Well Drillers
Soil Media	Clay loam	3	U.S. Soil Conservation Service - Bureau of Land Management
Topography	10 ft/1000 ft = 1 %	10	U.S. Geological Survey Topographic Maps
Impacts of Vadose Zone	Sand & gravel	8	U.S. Geological Survey State Engineer's Office
Hydraulic Conductivity of the Aquifer Units = Gals/Day/Ft^2	448.8 gal/ft^2	4	U.S. Geological Survey State Engineer's Office

DRASTIC WORKSPACE:

D-6

WHPA WORKSHEET
Public Water System Source Parameters

DATE:

Public Water System Information	
PWS Name	Village of House
PWS Identification Number (WSS#)	102-20
PWS Type (Community, N.C., etc.)	C
Source Type (Groundwater, etc.)	G
Number of Sources	1
Number of Entry Points	1
Population Served	69
Number of Connections	34
District	4
Field Office	Tucumcari
Environmental Specialist	Jim Edwards

WELL DATA (Include Units)	
S.E.O. Identification Number	
Well Name	Village well
Well Location (T.R.S.¼.¼.¼)	5N29E192.3.2
Latitude or Northing (if known)	N 34°38'43"
Longitude or Easting (if known)	W 103°54'18"
Year Drilled	1988
Casing Diameter	6 in r=3 in = 0.25 ft
Pumping Rate	60 gpm
Total Depth	103 ft
Static Water Level	52 ft
Depth to Center of Screen	95 ft (to pump)
Drawdown	8 ft

AQUIFER PARAMETERS (Include Units)	
Aquifer Name	Ogallala (Great Basin)
S.E.O. Closed Basin Name	House
Transmissivity	3000 ft²/day
Hydraulic Conductivity	60 ft/day
Aquifer (Saturated) Thickness	50 ft
Porosity	0.35
Storage Coefficient	0.2
Hydraulic Gradient	10 ft/mi = 0.001894
Direction of Groundwater Flow	from ENE
Ground Water Velocity	0.33 ft/day ≈ 120 ft/yr

E-7

State of New Mexico
ENVIRONMENT DEPARTMENT
District IV
1216 Mechem Dr.
Ruidoso, New Mexico 88345
(505) 258-3272

GARY E. JOHNSON
GOVERNOR

MARK E. WEIDLER
SECRETARY

EDGAR T. THORNTON, III
DEPUTY SECRETARY

VULNERABILITY ASSESSMENT SUMMARY

A vulnerability assessment has been completed for the following public water system:

Village of House — System Name
102-20 — WSS ID #

The accompanying map shows the locations of some potential contamination sources relative to 3, 6, 9, and 10-year wellhead protection areas, based on geohydrological models developed from the data shown on the WHPA worksheet.

The vulnerability assessment indicates that the following sources are susceptible to the potential contaminants indicated (sampling waivers DENIED):

SOURCES	CONTAMINANTS: EPA Test Method	CONTAMINANTS: Contaminant group
Village well	502.2	Volatile organic compounds (VOC-I)
" "	—	NO_2, NO_3 (waivers not available regardless susceptibility)

The vulnerability assessment indicates that the following sources are NOT susceptible to the potential contaminants indicated (sampling waivers GRANTED):

SOURCES	EPA Test Method	CONTAMINANTS
Village well	504	EDB & DBCP
	505	Organochlorine Pesticides & PCBs
	515.1	Acid Herbicides
	525.2	Semi-volatile pesticides
	531.1	Carbamate Pesticides
	547	(Glyphosate)
	548.1	(Endothall)
	549.1	Diquat
	552.2	Dalapon

Vulnerability Assessment performed by:

James W. Edwards — Name
Environmental Specialist — Title

Date: 02/28/97

House Municipal School
P. O. Box 673
HOUSE, NEW MEXICO 88121
(505) 279-7353

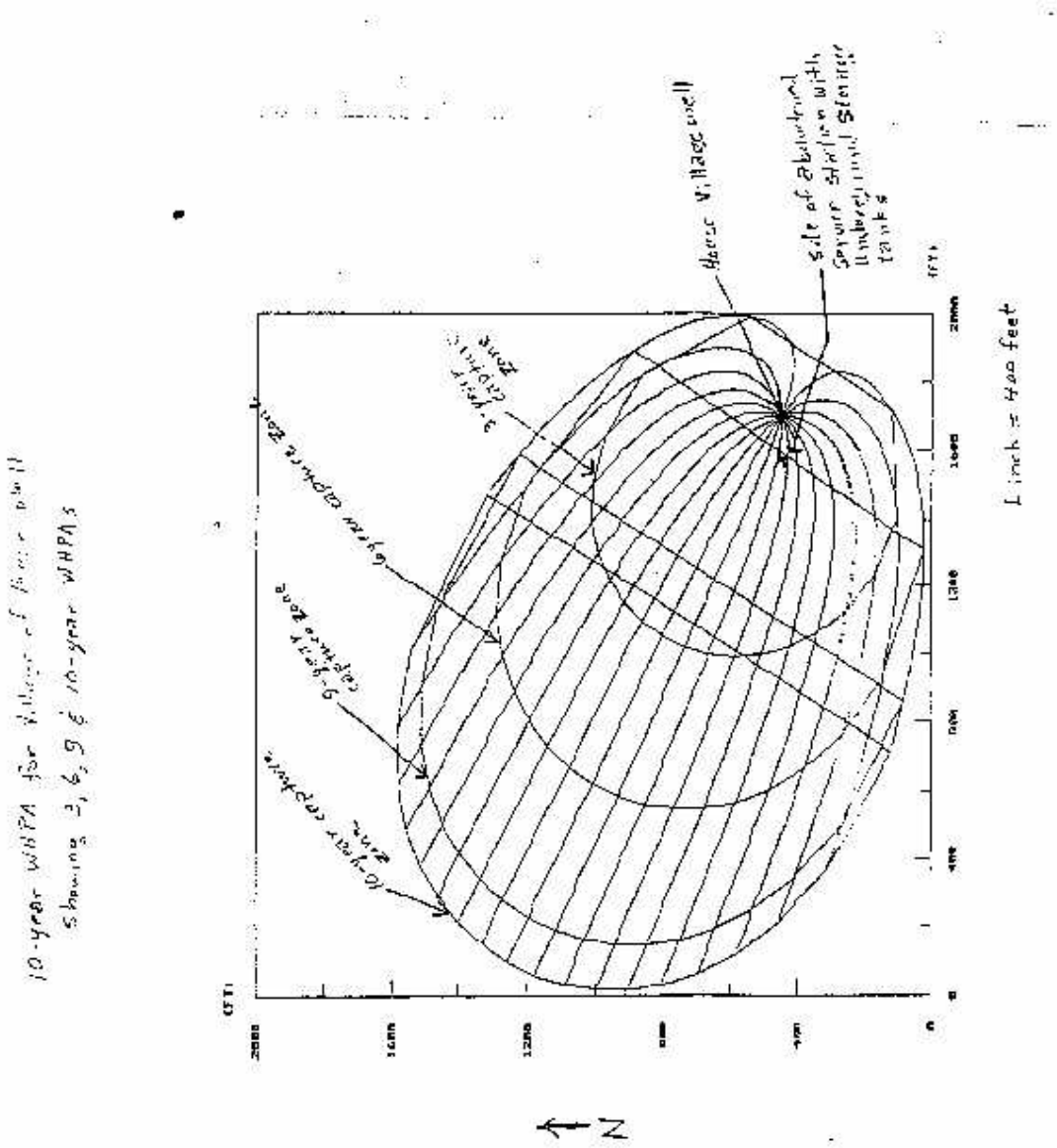
December 3, 1997

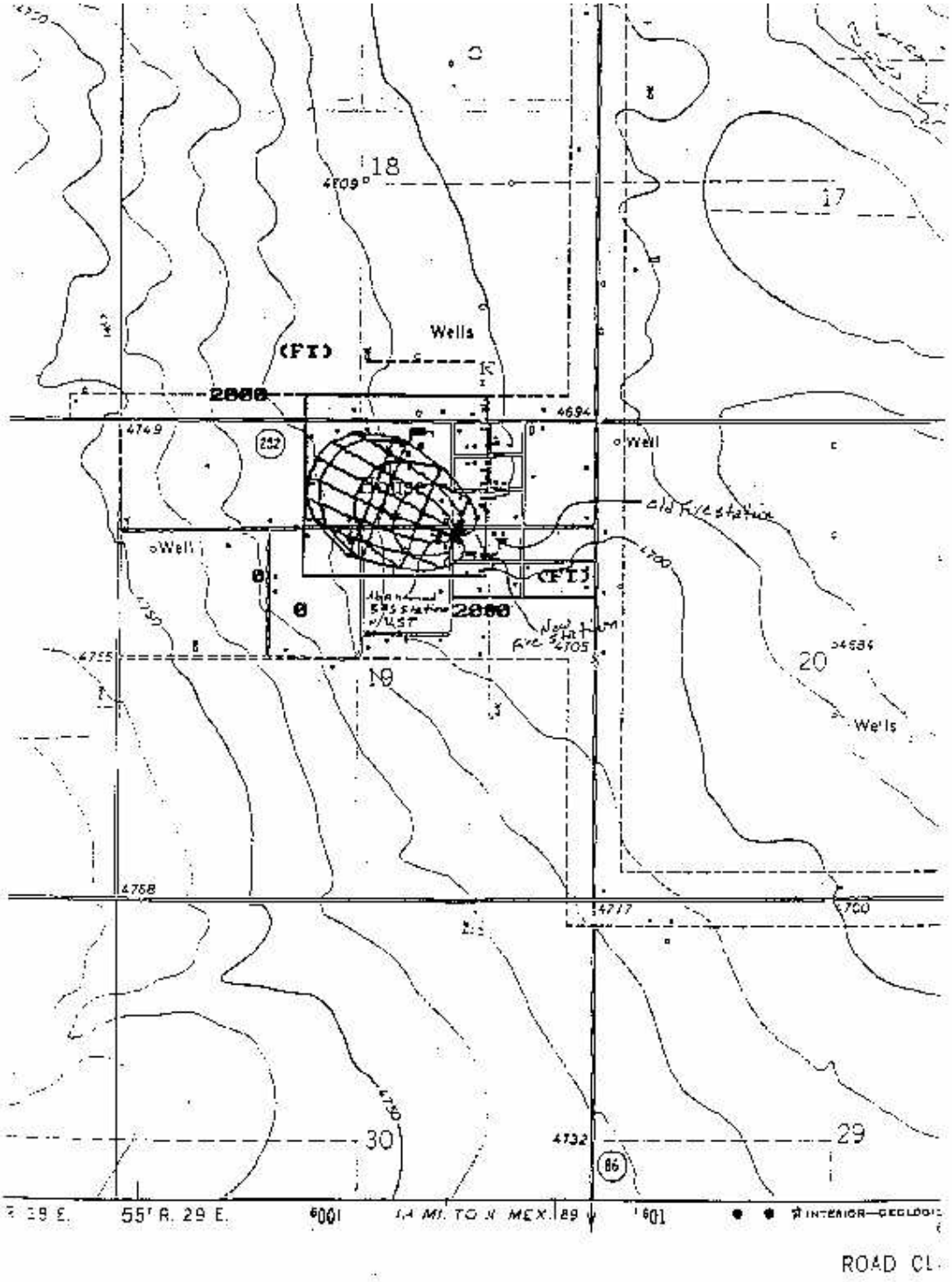
Village of House;

In regards to the Well Head Protection Plan of the Village of House, the House Municipal School System plans to pump and check their septic system one (1) time a year. Even though this system is outside the WHPA we feel that is a good program for the Village to protect their water source and good preventive maintenance for our school.

Thank You;

Alan Carson
Superintendent of Schools
House Municipal School System


10-year WHPA for Hance Village well
showing 3, 6 & 10-year WHPAs
3-year capture zone
6-year capture zone
10-year capture zone
Hance Village well
Site of abandoned Conquest Shrimp with limited-use storage tanks
1 inch = 400 feet
N


18
17
Wells
(FT)
2880
4694
4749
252
Well
Old Kyle station
Well
(FT)
2880
New Kyle
4705
20
19
Wells
4758
4717
4700
30
29
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86
55' R. 29 E.
6001
6001
ROAD CL

Villages of Logan and San Jon Application to Governor Richardson's Water Innovation Fund

June 11, 2004

Department of Finance and Administration
c/o New Mexico Finance Authority
409 St. Michaels Drive -
Santa **Fe,** NM 87505
1-877-275-6632; (505)-984-1454 and Fax (505)-984-0002
agonzales@nmfa.net
Re: Governor Richardson's Water Innovation Fund

Good Day,

The Villages of Logan and San Jon and Quay County are interested in Financial Assistance from Governor Richardson's Water Innovation Fund to assist in the utilization of non potable water which can be treated and incorporated into the municipal supply for both communities and associated Quay County residents between the Villages. The following information is provided for the consideration of this project per the format presented in your Memorandum dated May 21, 2004:

1. Village of Logan, Village of San Jon, and Quay County
2. Mr. Larry Wallin
3. Municipalities and County
4. Primary Contact address: Mr. Larry Wallin
   Village of Logan
   Box 7,
   Logan, NM88426
   (505) 487-2239 and Fax (505) 487-2400
   loganvillage@plateautel.net

5. Project Summary: Utilization of Non Potable Water (tds of 50,000) By using Reverse Osmosis (RO) in conjunction with pre treatment (slow sand filtration and nano filtration, a patented process) of non potable brine water to provide potable water for the Village of Logan and San Jon along with some residents in Quay County. The potable water would be supplied to a common distribution system for the Villages and county residents along the distribution system. The reject streams would be routed to solar drying beds for water evaporation and final harvesting of deposited minerals. This process would allow quality potable water to be provided to residents in Quay County through an in place distribution system from currently rejected non potable water thus conserving potable ground water. The Village of San Jon has to buy water from the Village of Logan since its ground water supply cannot provide the demand/quality needed for the residents. The use of evaporation ponds would allow the valuable minerals contained in the brine water to be harvested/utilized in a beneficial manner instead of being injected into the ground. A brief summary of the current and proposed operations/processes will be provided.

The Canadian River Water Mutual Association (CRWMA) is currently collecting brine water (approximately 500 gpm) containing over 50,000 ppm of TDS from ten shallow wells (approximately 150 feet deep) along the Canadian River south and east of Logan, NM. The

collection of the brine water is to prevent the salts in the water from entering the Canadian River which would in turn enter Lake Meredith and ultimately the CRWMA's water supply system. The collected brine water is injected into a deep injection well for disposal just south of Logan. Thus the brine water is not being used for any beneficial use and is deposited back into a lower aquifer. Treatment of the brine water will allow potable water for the residents in an area where the quality and availability of potable ground water is becoming a severe concern.

By processing the brine solution through a slow sand filter, a nano filter, and the Sea Water RO unit, the input brine water of 500 gpm will result in approximately 220 gallons of quality product water and approximately 280 gallons of reject water. The total volume of brine solution will be processed through the slow sand filter to reduce turbidity, the silt density index and iron/clay concentration. The nano filter will separate the calcium and magnesium from the product stream and the reject from the nano filter would be directed to approximately 48 acres of evaporation ponds for calcium, magnesium and some salt which would be harvested. The Seawater RO unit would provide quality product water for use in the municipal system and highly concentrated brine reject water to 52 acres of evaporation ponds for salt drying and eventual harvesting. The patented combination of slow sand with nano filtration offers the significant benefit of water treatment without chemicals. This combination successfully was piloted by the University of Arizona beginning in 1987. It was later patented. Other pilot projects include a two year study in Marana on Colorado River Water from the Central Arizona Project Canal. This was followed by a study by the American Water Works Research Foundation in Tucson, Arizona. The process has been utilized successfully in other projects using sea water and is ready to be used on this project.

This project is innovative for the processing of brine water which is being injected into the ground (approximately 4000 feet below the surface) to provide potable water for the area while utilizing the minerals and evaporating moisture to the atmosphere. The team players (Villages ofLogan and San Jon along with Quay County and CRWMA out of Texas) are working as a group to ensure quality water is available/maintained in eastern New Mexico and west Texas. Thus a much needed resource is provided from a current reject stream of such a valued commodity. CRWMA already has operational personnel at their Logan Facility who could operate the facility in conjunction with their collection system.

The infrastructure is in place for collecting the brine, distributing the potable water and sitting the process equipment. The process equipment, buildings and land for ponds will need to be planned and developed. The Village of San Jon and residents in the county between Logan and San Jon need a supply of good quality water. The source of ground water for the Village of San Jon is steadily decreasing and supplemental water will be purchased from Logan. The brine water is being injected and not beneficial to the water scarce area. The project long range goal is to provide quality water to residents of Quay County from a reject stream while maintaining water quality for the CRWMA. The minerals harvested from the evaporation ponds will assist in financing the operation of the facility thus reducing the operational costs. The short term goal would be to provide quality water to the residents of the Villages of Logan and San Jon along with county residents between the two communities. This water would be significant economic stimuli for the area and assist the environment by utilizing a water waste stream in a beneficial manner. The process would provide excellent quality water (approximately 86 million gallons per year) for consumption in this area.

The opinion of probable cost is $2,942,600 for the slow sand filter(s), nano filtration, RO units, Building, site piping and approximately 100 acres of evaporation ponds. The project could be phased with only the treatment system provided initially. This would cost approximately $1,452,000. The operation would be coordinated with the entities involved. With the critical state

of water supply in the area, this process which has been used in Arizona could help provide the potable water needs in the area while maintaining clean water for our neighbors in Texas. Currently no other funds have been committed to this project. CRWMA is maintaining the collection and injection systems which would be an integral part of the proposed project.

Scope

Currently, brine water containing over 50,000 ppm of TDS is being collected from several shallow wells near Logan, New Mexico to prevent the salts in the water from entering the Canadian River, Lake Meredith, and ultimately the CRWMA water supply system. The brine water is routed to a deep injection well for disposal. This report is a preliminary study of alternatives to reduce the amount of brine water being injected in the deep well. The technologies examined in the report are solar evaporation, reverse osmosis, and a combination of the two. The report is a combined effort between Parkhill, Smith & Cooper, Inc. (PS&C), and John Pyles (JP), a solar evaporation consultant. The basic data of the report are contained in the accompanying spreadsheet. The spreadsheet calls out flow volumes, TDS levels, product amounts, capital costs, operating costs, and information on potential revenues. Two feed rates were examined - 250 gpm and 500 gpm. The study is preliminary and was conducted in a short time frame. Several simplifying assumptions have been made. The assumptions are discussed below. It would be prudent to add a contingency factor of at least 25% to all costs.

Alternatives

1. Solar Evaporation

Solar evaporation uses the sun and wind to remove water from a salt brine, concentrating it to a point where solid phase minerals are precipitated. The process is typically carried out in shallow earthen ponds. The brine is fed from pond to pond in series, becoming more and more concentrated. These initial ponds are called "concentrator" ponds. Most of the acreage involved is in concentrators. After about 90% of the original feed volume has been evaporated, the brine will be saturated in sodium chloride. (There will be other minor minerals formed, but for this report we will concentrate on sodium chloride.) At this stage, the brine is moved into "crystallizer" ponds where crystalline salt is formed. When about 95% of the original brine volume has been evaporated, the remaining high TDS brine will be sent to the deep well injection system. The solar evaporation process will not evaporate all of the water. The salt left behind can be harvested, washed and sold, or stored. The only difference, other than size, between a oncentrator and a crystallizer pond, is the crystallizer will develop a salt floor. The flow from pond to pond will be done mostly by gravity using simple control gates. There will be few pumps.

One operator can run the facility including shipping, but not including equipment maintenance and salt harvesting.

Feed brine analysis indicates that the brine is more concentrated than seawater, but is very similar to seawater that has been evaporated and concentrated to the same TDS as your brine. See the brine analysis worksheet on the spreadsheet. Terefore, the CRWMA feed brine will behave similarly to seawater brine. Much is known about the behavior of seawater brine.

Evaporation rate and rainfall are the two most important climatic variables in designing a solar evaporation facility and help determine its size and capacity. Climate data has been obtained from the Ute Dam weather station and from Tucumcari. The Ute Dam station operated from 1965 to 1979 and supplied average data showing seasonal variation. The Tucumcari station has

operated since 1904 and shows the yearly variability of the climate. The average Ute Dam data show a climate well suited to a solar evaporation facility. The variability shown in the Tucumcari data indicate there can be wide swings in facility performance from year to year. The facility design will have to take the variability nto account to allow smooth yearly functioning of the brine wells and the injection system. Yearly variation in the actual amount of salt produced and the amount of remaining brine for injection will remain unsmoothed. The theoretical variation can be calculated.

Seepage is another important variable in determining the size of the pond system. Seepage refers to the amount of brine that will leak from the pond bottoms and flow into the uppermost aquifer. Seepage is difficult to measure. As no soil studies have been done for this report, reasonable assumptions have been made. Soil Survey reports as prepared by the USDA Soil Conservation Service were obtained and reviewed. The soil survey indicated that, in the project area, a very hard layer of bedrock and cemented caliche exists 2 to 3 feet below the surface. Since the solar ponds are by nature very shallow, limited excavation will be necessary to form the ponds and dikes, with the likely pond bottom being just above the hard layer of material. Seepage is very normal in solar ponds and is expected. Existing solar salt facilities at United Salt near Carlsbad, and nearby competitors, do not have lined ponds to eliminate seepage. Hopefully, the New Mexico Environmental Department can be convinced that no liner is needed for this potential project. A requirement to line solar ponds with plastic would be very expensive and would likely derail the project. No liner is assumed for this analysis.

Once the solid salt has formed on the crystallizer bottoms, you can go two directions: storage or sales. If sale of the salt is not feasible, the salt formed will have to be stored or stockpiled. This can be done in place, or the salt can be removed to a remote storage location. Storage in place can be done without the cost of harvesting, but crystallizer levee heights will have to be increased every few years. At some point the crystallizer would have to be abandoned and a new one made. Or the salt can be harvested and stockpiled in a remote location. There is an alternative where you would not have to deal with solid phase salt. In that case, you would not build crystallizer ponds and send brine from the concentrators directly to the injection system. The amount of brine and its TDS are shown on the spreadsheet as "Waste Flow to Solar/Inject". In this case, the volume reduction is about 90%.

The climate in the region will not evaporate 100% of the feed brine. Some brine will remain to be injected. It will be a high TDS brine. The amounts and concentration are shown on the spreadsheet. The main constituents of the remaining brine will be sodium chloride, magnesium chloride, and magnesium sulfate. This brine must be removed from the crystallizer at some point to maintain the quality of the salt being formed. Leaving the brine in past this point will precipitate a high level of contaminating solid phase minerals in the salt which will be difficult to remove by washing. This brine will be removed in batches and placed in a holding pond awaiting injection.

The initial and operating costs shown in this study include a full blown facility in which salt is made, harvested, washed, dried, and sold. Future estimates could scale back the scope of the facility and its costs to whatever level is desired. It is anticipated that salt harvesting will take place once per year toward the end of the warm season. Harvesting will take approximately 3 weeks based on 5 days/wk, and 7.5 operating hours/day for the 250 gpm case - twice as long for the 500 gpm case. A crystallizer pond will be drained of brine, a motor grader will rip the salt crop and then windrow the salt. A front-end loader can then load trucks. Other equivalent

equipment can be used. It is recommended that RWMA look into contracting the harvest work unless you already have such equipment and operators that would be available for this work.

As the salt is being harvested, it will be washed. Washing removes dirt, gypsum, and magnesium contaminants. The wash system consists of a truck dump hopper, a screw washer (like those used in sand and gravel), a static screen (no moving parts) to remove the bulk of the wash water, and various conveyor belts, pumps, piping and electrical connections. There will also be a small wash settling pond to collect the debris from the washing process. From the washer, the salt will be conveyed to a stacking system. The salt will be stacked and more water will drain from **it.**

Salt sales are assumed to be targeted for deicing during the winter months in nearby communities. Many deicing contracts call for the salt to be dried before shipment. Drying is done in a fluid bed drier, which is fuel fired. Salt would be removed from the stack, fed to the drier, and stockpiled in anticipation of sales in covered storage. Trucks would be loaded from covered storage with a front-end loader. The drier equipment would also be located under cover.

It is assumed that infrastructure items such as office space, maintenance areas, equipment storage, security, incoming power, etc. are available and existing at the current injection well site. Injected brine from a solar evaporation facility will need to be filtered, as is current practice, before injecting.

The life of the earthworks portion of a solar facility is unending given normal maintenance. For example, the salt works in the San Francisco Bay area began in the 1850's, and is still operating. The levees will last as long as they are maintained. The washing and stacking equipment can easily last 20 years. Corrosion is definitely a factor, and it leads to increased maintenance costs, but it can be handled. Remember, tax life and actual life are two different things.

2. Reverse Osmosis

In reverse osmosis (RO), pressure forces the feed water through a semi-permeable membrane element. The membrane will freely pass water but rejects most of the dissolved materials as well as any small particles in the feed water. Reverse osmosis membranes are kept from fouling by maintaining a high quality feed water. When membranes become fouled, reducing effectiveness, they are cleaned with a chemical solution in a Clean-In-Place (CIP) procedure. When in operation, feed water will flow into the system from the MMF and cartridge filter pretreatment system, permeate will flow to use, and concentrate will flow to concentrate disposal.

The first step in the operation is to filter the incoming brine. First the brine flows through a multimedia filtration system to remove all the large particles. Cartridge filters will follow the multimedia filtration system. These cartridge filters will remove particles to a nominal size of 5 microns.

The cartridge filter system is used to remove fine suspended matter from water, typically down to 5 microns in size. A cartridge filter consists of a filter housing and filter elements mounted to tube supports. Water enters the housing and flows through the filter elements. The suspended solids are trapped in the fine fibers of the filter.

The particulate matter suspended in the water is collected and entrained internally in the filter elements, and the elements cannot be cleaned in place. Threfore, they must be replaced periodically. Cartridge filter elements are not reusable, and all cartridges in an array should be replaced at one time for maximum efficiency.

The reverse osmosis system will consist of a single stage system with 14 pressure vessels and the associated high pressure pump. Each vessel houses 6 (six) membrane elements. Chemical dosing will be provided to the feed water to control scaling and fouling of membrane elements. Chemical feed systems will include acid for pH adjustment and anti-sealant for barium sulfate scale control.

The reverse osmosis system will have two main outputs in addition to the waste from the chemical treatment system. The first output is relatively low TDS water, which may be usable in the CRWMA drinking water system but may still have TDS concentrations in the 300 to 1,500 mg/l range. If indeed the product water has TDS values in this upper range, its marketability as a potable water may be diminished without subsequent treatment by an additional R. 0. unit. The second output is high TDS water ready for injection. The volumes and TDS levels are shown on the accompanying spreadsheet. The existing filter system for injection may not be needed as reverse osmosis would duplicate the filtrate level of particles.

CRWMA has previously received three proposals for the application of reverse osmosis technology for the brine treatment, including Ionics, U.S. Filter, and GE. These proposals were provided for review and use in this study. The GE proposal seemed generally not responsive to the specific input parameters of both flow and TDS. The Ionics proposal was the most expensive of the two remaining and was used as the basis for this report. Other leaders in the application of R. 0. technology include Zenon and Pall.

Since at least one of the objectives of the project is to potentially provide marketable potable water, the integrity testing of the R.O. equipment will be essential. Most equipment control panels incorporate this testing into normal operation, subjecting each rack of equipment to the required testing daily. It is recommended that sufficient follow-up with the appropriate regulatory authorities in New Mexico be contacted to determine the ramifications of CRMWA becoming a public water supplier, particularly if the water is to receive no further treatment prior to introduction into the distribution system.

The treatment costs for operation and maintenance of the R.O. equipment were obtained from Ionics representatives, indicating that the costs could likely approach $5.00 per 1000 gallons. Although the cost might be less than the stated amount, the very nature of the water to be treated will result in excessive and ongoing maintenance costs, including chemicals to prevent scaling as well as replacement of the membranes at more frequent intervals.

3. Reverse Osmosis followed by Solar Evaporation

This alternative is a combination of the two methods discussed above. RO would be the first step in the process since that it works better with dilute feeds. Solar salt production is enhanced by more concentrated feeds. The high TDS brine coming from the RO unit would feed the solar evaporation ponds.

The two combined technologies would produce both potentially low TDS water for use in the CRWMA drinking water system, and salt that could be sold.

Methods

1. Solar Calculations

Calculations resulting in the size of the ponds and flow rates from the ponds were done by JP using a proprietary model. The model was built over a period of years and has been validated by the performance of facilities that have been built using the model. Cargill's Freedom, OK facility was designed using this model for example. As with most models, the inputs are critical to the results and some experienced judgement is needed to use the right inputs or determine the range of possible inputs.

Seepage rates are a large unknown at this point. A range of possible seepage rates were explored and resulted in the range of possible salt production shownon the spreadsheet. A closer approximation of seepage can be obtained with on-site testing. However, aggregate seepage over a large area is difficult to determine and its true affects will become known only after startup. Theassumed seepage rates were 100,000 gal/acyr and 300,000 gal/acyr.

Calculations were done based on a Ute Dam 14 year average of 89.4 inches per year of evaporation from a Class A weather pan, and 14.6 inches per year ofrain. The detailed data obtained from nearby Tucumcari indicate considerable year-to-year variability in both evaporation and rainfall. For example, the maximum rain year had over 24 inches while the minimum had just 10 inches. The standard deviation is almost 4 inches. Similar large variation exists for evaporation. The impact of these variations is that the amount of salt produced each year will vary, the brine inventory in the ponds will vary, and the amount going to injection will vary.

The various iterations of the model gave total solar pond acreages varying between 89 and 102 acres for the solar evaporation only case at 250 gpm. For the purposes of this report, all cost estimates for the solar evaporation only system at 250 gpm are based on 96 acres. This simplifying assumption will not cause a large error in the cost estimates. Double all the above for the 500 gpm case.

A similar simplifying assumption was made for the solar evaporation plus RO alternative. Here the areas varied between 56 and 64 acres. An average of 60 acres was chosen for costing at the 250 gpm feed rate and 120 acres for the 500 gpm feed rate. A surge/storage pond to hold brine that has been drained from the crystallizers and is awaiting injection is not included in the 100 acres, nor is a small pond associated with the washing system.

2. Reverse Osmosis

The Ionics proposal was used as a basis for the estimates in this report. The main criterion was that it is the highest initial equipment cost. Typical cost of constructed installations vary from 2 to 2.5 times the cost of the equipment to **be** incorporated, taking into account related items such as buildings, electrical, mechanical, and labor for construction.

It is highly recommended that pilot testing by various manufacturers of R.O. equipment be conducted prior to the selection of a particular manufacturer of equipment. Since the R.O. technology incorporates various configurations and types of equipment, such pilot testing will

not only identify the most applicable equipment option but will also aid in the design of associated improvements - primarily electrical and building space requirements.

Discussion of Results

The "numbers" results are shown on the referenced spreadsheet. Two feed rates were explored - 250 gpm and 500 gpm. Each feed rate has a separate worksheet. There are results on both worksheets from the following alternatives:
solar evaporation only, solar evaporation plus reverse osmosis, reverse osmosis only, and the current system. Feed TDS was held at 52,426 ppm.

Fresh water flow only results from reverse osmosis operation. There is no fresh water flow from the solar evaporation only and current system alternatives. Fresh water flow and TDS are shown.

The other product of a reverse osmosis system is a waste stream. The Ionics proposal did not initially state the TDS in the waste water stream. The waste water TDS was calculated assuming that TDS not in the fresh water stream had to be in the waste stream - e.g. ((52,426 x 500) - (200 x 278)) / 300 = 87,191. Subsequent information from Ionics verified that the waste water concentration could be expected to be in this 8.5 to 9.0 % range (85,000 to 90,000 mg/l). Waste water flow and TDS are shown. This steam would flow to either solar evaporation or directly to injection depending on the alternative.

These results address how many acres, over and above that currently used for injection, will be needed for these alternatives. It was assumed that an RO alternative could be built on the existing footprint of the injection site, so no additional acreage is needed for the RO portion of any alternative. A solar evaporation only alternative at the 250 gpm feed rate will require 100 to 110 acres for everything including ponds, wash system, salt stack, drying, and customer loading. Solar evaporation only at the 500 gpm feed rate will require 200 to 210 acres. A combined solar/RO alternative at 250 gpm will require 65 to 75 additional acres, and 120 to 135 acres at the 500 gpm rate.

Salt can only be produced if solar evaporation is part of an alternative. So no salt is produced from the RO only and current system alternatives. Both fresh water and salt are produced from the combined solar and RO alternative. The salt tonnage was calculated using the fixed average evaporation and rain amounts. The range of tonnage within each alternative is the result of the two seepage rates discussed above. The use of RO in conjunction with solar evaporation does not materially change the amount of salt made, it just produces fresh water. The salt tonnage shown is the amount available for sale. The total amount of salt made is about 33% larger. The difference is due to losses at each step. The losses are recycled back to the system.

The pond system could be operated to not produce any salt. In this case, the waste flow to injection for the 250 gpm feed case would be 33 to 53 acft at a TDS of 332,000. Double the volume for the 500 gpm case. Numbers associated with this variation are not shown on the spreadsheet.

Any alternative will have a waste stream. Since a solar evaporation system will not evaporate all the brine, these results show the acre-feet of waste produced per year and its TDS. This waste will flow to the injection system.

The reduction of flow and TDS to the injection system is of prime concern in this report. The worksheets show the volume and TDS of the current injection system. RO alone will reduce the

volume by 40%, but the TDS is increased. The solids loading for injection is only reduced 0.1% by RO alone. Solar alone or in combination with RO will reduce the volume going to injection by 97%. Solids loading for injection will be reduced about 80% by solar alone or in combination with RO.

The installed costs of the various alternatives are shown. These numbers were calculated by PS&C with input from JP. Details of the cost estimate are shown on the spreadsheet titled "PS&C Cost Summary". Please note that the estimated costs are for a complete system including, where applicable, nearly fresh water available for further use, and salt harvested and dried ready for shipment. Less "complete" alternatives could also be built. The "PS&C Cost Summary" will give an idea of the associated cost reductions.

A contingency of 25% was added to each cost estimate. The contingency amount can easily be changed if desired. Amortized costs are also shown on the "PS&C Cost Summary".

Operating costs for RO are shown. Operating costs for solar evaporation are not. Power, fuel and maintenance costs for solar are calculated on the "PS&C Cost Summary". Harvest costs are not calculated. It is recommended that CRWMA look at contracting the harvest operation, which will be the largest operating cost factor. Combining the "PS&C" operating costs with the CRWMA estimate of harvesting costs will give the total solar operating cost.

Any potential revenue from salt or water must be calculated by CRWMA.

Salt Sales

It is anticipated that the main market for any salt made will be the winter deicing of roads in northeastern New Mexico and adjacent parts of Texas. In New Mexico, salt is purchased by the State for State highways, by the Counties for County roads, and by cities. For example, the State has a written contract with a primary vendor to deliver salt to various locations at a certain fixed price for that location. If the primary vendor cannot make a delivery, the State can go to a secondary vendor. A similar situation may exist in Texas. Delivered prices for certain locations on the NM State contract are:

Animas	$43/ton
Cliff	43
Deming	36
Fort Sumner	20
Albuquerque	36
Tucumcari	33
Taos	45
Santa Fe	39

The primary vendor appears to be located in southeast NM and will likely have a much larger supply than what can be produced by CRWMA. CRWMA will have to determine whether it can beat the existing delivered prices in your target local area. The market is currently served, so CRWMA will have to take business from existing competitors while meeting the quality requirements and delivery schedules. Typically, you would have to lower the delivered price to get the business.

The salt will have to meet minimum quality standards that could vary at the different selling points. An additive may have to be sprayed on the salt in small quantities for some locations. Vendors must also sense that the supply is reliable. They may be reluctant to sign a contract with anyone who they sense might run out of salt during the snow season. An inventory of salt

may have to be created to satisfy this need. The variability of the weather from year-to-year and its affect on the size of the salt crop will influence this issue.

Environmental Issues

The primary environmental issue is likely to be seepage of salt brine from the pond system into the upper aquifer. United Salt has a solar evaporation operation in southeast NM. They were contacted to inquire about this issue. United does not have, nor have they ever been required by the State to have liners under any of their ponds. None of their nearby competitors in the state have liners. They don't have any future expectations of problems in this area.
As long as CRWMA is not contaminating a drinking water source (other than your own, which you can control), seepage and a requirement for pond liners may not be an issue. PS&C has estimated liner costs at $3.25 million plus contingencies for 96 acres and $2.0 million plus contingencies for 60 acres. These numbers are not included in the cost estimate on the spreadsheets.

One potential problem related to the construction and operation of the solar ponds is related to the very hard layer of material located just beneath the surface in the project area. Although its existence might be useful in arguing against the need for a liner, until such time as the ponds tend to seal themselves (if that occurs), brine could move laterally along the hard layer and intercept the land surface down-gradient outside the boundary of the pond system, resulting in seeps.

Depending on the soil type in the pond area, vegetation immediately adjacent to the pond levees could be killed or stunted. Unless there is an endangered plant species on the site, this should not be a large issue.

The ponds will become an attraction for wildlife. This has generally positive environmental impacts. The number and variety of bird and animal species are likely to increase. Environmentalists and agencies tend to see this as a plus. Introduction offish into the ponds, if possible, will enhance this affect.

Startup

Starting a solar salt facility is akin to planting a vineyard to grow wine grapes. You plant the grapes, nurture them, and wait three years for your first usable crop. Your cash is all spent up front, well before any revenue is realized. So it is for a new solar facility.

In terms of salt produced, startup will take two to five years. In year one, the salt crop, if any, will be small. Seepage will be large during startup until the seeped brine reaches the water table. The increased seepage will reduce the size of the salt crop. Depending on the soil type, the period of increased seepage could last more or less than one year.

It is highly likely that harvesting a salt crop from a salt floor in the crystallizer will be advantageous. A salt floor is a permanent layer of salt that always remains in each crystallizer. The salt floor helps seal the pond bottom, provides a solid base on which to operate the harvesting equipment, and prevents digging up mud along with the salt crop. It will take one or more years to build up the salt floor. During this time no salt will be available for sale. If salt will eventually be sold, the salt floors will be your main item of working capital for the project.

There will be a learning curve for both the operation of the facility and sale of the product. This will affect the time period of the startup. The learning curve is also felt by any solar designer or

consultant associated with the project. Each site has a different set of circumstances and natural phenomenon, only some of which can be known before startup. Plan on making adjustments to the design after startup. The best solar design can only get within plus or minus 25% of the design tonnage. For the purpose of calculating the revenue from salt, estimate that the first two
years of operation will produce the salt floor from which future harvests would be conducted - so no salt to sell in the first two years. Then figure 67% of a full crop in the third year, and finally a full crop in the fourth year.

Appendix H

ARCH HURLEY CONSERVANCY DISTRICT WATER CONSERVATION PLAN

Tucumcari Project
Arch Hurley Conservancy District

Water Conservation Plan

Arch Hurley Conservancy District
101 East High Street P.O. Box 1167
Tucumcari, New Mexico 88401
Voice: (505) 461-2351 Fax: (505) 461-4061

Arch Hurley Conservancy District

Water Conservation Plan

INTRODUCTION

The development of this Water Conservation Plan was funded by a grant from the United States Bureau of Reclamation and was developed using software from the Bureau. This plan provides information on past history, current procedures, management, and future plans of the District. Maps include one General Soils Map and two General Project Maps. Copies of this plan will be provided to the five members of the Arch Hurley Conservancy District Board of Directors. This plan is contingent upon the following:

A. The plan shall not constitute a contract or agreement and is subject to change by the District.

B. This plan is subject to change by the Board of Directors of the District.

Step 1. Description of the District

Some data called for in these Criteria may not be available. Include in the plan how the District will gather those data and have them available for the next plan update.

The description includes appropriate overviews of the District's history, location, size, topography, soils, natural environment, cultural resources; climate; water supplies; water uses; storage, distribution facilities; drainage facilities; water measurement and accounting procedures; water pricing and billing practices; water shortage allocation policies; and operation and maintenance program.

A. History

Date District formed: **1937**

	date	AF	AF
First USBR contract	**12/27/38**	AG **300,000**	Other **None**
Contract renewal	**N/A**	AG	Other
2000 Information		AG **300,000**	Other **None**

The original contract has been amended several times: 1953, 1958, 1961, 1974, and 1985.

B. Location

Provide a map(s) showing District boundaries and regional location or describe the District's boundaries and location. **A map of the District is included with this Plan.**

C. Size

	total acres	irrigated acres
Size at first USBR contract	**110,000**	**42,213.7**
Size in 1980	**134,000**	**42,213.7**
Size in 1990	**134,000**	**42,213.7**
Size in 2000	**134,000**	**42,213.7**

The area of 134,000 acres is an approximate figure.

D. Topography

Describe the topography (e.g. hilly, sloping to a water course) of the District. Discuss any impact of topography on District water management. **The District can be described as nearly level to strongly sloping. The land generally slopes toward several water courses, some of which have running water at least part of the year. Some of the land is steep enough so that an efficient irrigation system cannot be designed without more costly systems such as sprinklers.**

E. Soils

Provide a Soil Association map (from NRCS) locating the elements Described below. **Project soils are reddish brown with highly calcareous sub-soils. Surface soil textures vary from loamy sands of high permeability to friable clays of low permeability. The topography is smooth to gently rolling. Drainage is good to moderately deficient.**

Provide District soil associations (contact NRCS for information).

soil association	est. acres	effect on water operations and management
Quay-Montoya-Lacita	**29,700**	**The hazard of soil blowing is moderate. The hazard of water erosion is moderate to severe.**
Ima-Tucumcari	**5,400**	**Properly designed irrigation systems are needed to conserve both soil and moisture.**
Redona Canez	**14,850**	**The hazard of soil blowing is moderate to severe. Hazard can be controlled by installation of practices that conserve soil and water. Properly designed irrigation systems are needed to conserve soil and water.**

Describe any limitations resulting from soil problems (e.g., salinity or high water table, extremely sandy soils, low infiltration rates, etc.).within the District.

soil problem	est. acres	effect on water operations and management
Seepage	**Unknown**	**Areas with high water table and high salinity limit the crops that can be grown in some soils.**
Low Permeability	**Unknown**	**Some soils such as the Montoya soils have very low permeability.**
Slopes	**Unknown**	**Strongly sloping soils require more expensive irrigation systems such as sprinklers.**

F. *Natural Environment*

Describe known environmental resources (e.g., wetlands, rivers, lakes, flyways) within the District.

name	est. acres	description
Tucumcari Lake	**640**	**Shallow water lake just east of Tucumcari. Several Arch Hurley open drains drain into the lake.**
Pajarito Creek	**N/A**	**Creek with running water most of the time except in extreme drought conditions. Part of the project area drains into the Pajarito Creek. The creek eventually drains into the Canadian River.**
Plaza Larga Creek	**N/A**	**Part of the project area drains into the Plaza Larga Creek. The creek eventually drains into the Canadian River.**
Barranca Creek	**N/A**	**Part of project area drains into the Barranca Creek. The creek eventually drains into the Canadian River.**

G. *Cultural Resources*

Describe any known cultural resources within the District. **N/A**

H. *Climate*

Describe the general climate of the District. **The Tucumcari area has a semiarid, continental type of climate characterized by distinct seasonal and wide diurnal temperature changes, low humidity and generally clear skies. Summers are warm. Temperatures exceed 90 degrees F. on an average of 80 days a year and 100 degrees on an average of 10 days a year. They fall rapidly after sunset, however, and average in the low sixties in most nights. The drop is generally accompanied by a low relative humidity, with the result that most summer nights are relatively cool. Winters are mild, sunny and dry.**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
avg precip	0.36	0.47	0.71	1.13	2.01	1.91	2.64	2.76	1.50	1.30	0.65	0.59	16.03
avg temp	38	42	49	57	66	75	79	77	70	59	47	39	58
max temp	53	57	64	73	81	90	93	91	85	75	62	53	73
min temp	24	27	33	42	51	60	65	63	56	44	32	25	44

For weather data, specify the period of record (30 years recommended) and reference used.
Weather information is from the Tucumcari Agricultural Center in Tucumcari for the years 1905 to 2000.

Average annual frost free days: **195**
Describe the impact of any microclimates on water management within the District. **None**

I. Water Supplies

Water Source	1980 AF	1990 AF	2000 AF
USBR Irrigation water	**72,748**	**78,491**	**118,244**
state project water	**0**	**0**	**0**
other imported water	**0**	**0**	**0**
local surface water	**0**	**0**	**0**
upslope drain water	**0**	**0**	**0**
District groundwater	**0**	**0**	**0**
private groundwater (est.)	**Trace**	**Trace**	**Trace**
transferred water	**0**	**0**	**0**
reclaimed water	**0**	**0**	**0**
other	**0**	**0**	**0**
TOTAL	**72,748**	**78,491**	**118,244**

Private ground water is relatively insignificant and the few existing wells are sometimes used to supplement USBR water on the same acreage.

Provide the annual entitlement under each right and/or contract.

source	AFY	contract #	contract restrictions
USBR	**300,000**	**300,000**	**Limited only by availability of water.**

Describe any ground water basin(s) that underlie the District.

name	size (sq. mi.)	usable capacity (AF)	safe yield (AFY)
Entrada	**Unknown**	**400,000**	**Unknown**

List and describe District operated water wells.

name (State ID#)	(T, R & S)	Pumping capacity (G.P.M.)
None		

List and locate District operated ground water recharge areas.

name	(T, R & S)	acreage	recharge capacity
None			

Describe any District conjunctive use program, and the source & quality of recharge water. **None**

J. *Water Uses*

List crops with 5% or more of total acreage - Select from attached crop list (page 26).

1980	acres	1990	acres	2000	acres
Sorghums	**13,201**	**Irrigated Pasture**	**17,914**	**Irrigated Pasture**	**14,805**
Wheat	**6,301**	**Alfalfa Hay**	**4,889**	**Alfalfa**	**8,385**
Irrigated Pasture	**4,905**	**Sorghums**	**4,521**	**Cotton**	**3,807**
Alfalfa	**3,515**	**Wheat**	**2,007**	**Other Hay**	**2,309**
Cotton	**1,653**			**Wheat**	**1,649**
misc. (<5%)	**2,441**	**misc. (<5%)**	**1,140**	**misc. (<5%)**	**1,347**
TOTAL	**32,016**	TOTAL	**30,471**	TOTAL	**32,302**

List the five major irrigation methods (by acreage) - Select from attached list (page 26).

1980	acres	1990	acres	2000	acres
Graded Surface	**28,698**	**Graded Surface**	**26,023**	**Graded Surface**	**25,027**
Sprinkler	**3,318**	**Sprinkler**	**4,448**	**Sprinkler**	**7,275**
all other		**all other**		**all other**	
TOTAL	**32,016**	TOTAL	**30,471**	TOTAL	**32,302**

List the acreage of vegetable-germination irrigation methods used in the District. **N/A**

K. *Storage*

Describe the District's storage facilities (reservoirs, regulating reservoirs, tail-water recovery systems, recharge, areas etc.), including capacity and location. **The water supply for the Tucumcari Project is stored in a reservoir created by Conchas Dam at the confluence of the Conchas Creek and South Canadian River, 31 miles northwest of Tucumcari, New Mexico. The approximate usable capacity of the reservoir is 278,599 acre feet. The dam was constructed in 1939 by the U.S. Corps of Army Engineers. It is operated by the Corps of Army Engineers under a memorandum of understanding with the Bureau of Reclamation.**

L. *Distribution Facilities*

Describe District diversion facilities.

diversion point	Description
Conchas Dam located approximately 31 miles northwest of Tucumcari, New Mexico	**The irrigation outlet works is a circular pressure tunnel leading to the gate chamber, then into two steel penstocks in a horseshoe tunnel.**

Describe the District's conveyance system.

miles unlined - canal	miles lined - canal	miles piped	miles - other
195	**76**	**<5**	**None**

The figures shown above are approximate.

Describe whether the District's delivery system provides immediate delivery, scheduled delivery, rotation, combination of these, or other. **The method of delivery is delivery upon request with a 24-hour notice. Water shut-off also requires a 24-hour notice.**

Describe planned changes or additions to District facilities for 1997-2002. **The District proposes to convert several miles of unlined ditches to underground pipelines as funds are available. The District also plans to install metering devices where such devices don't exist and where existing metering devices are not adequate.**

M. Drainage Facilities

Describe the District's drainage facilities (surface and sub-surface). **The District has approximately 75 miles of open drains. These drains were designed to drain both surface and subsurface water.**

N. Water Measurement and Accounting Procedures

total # of customers: **580** total # of measured customers: **Unknown**

total # of customer turnouts: **566** total # of measured turnouts: **475**

Provide the number of each type of measurement device used by the District and maintenance schedule

Type	number	accuracy (percentage)	reading (days	calibration (months	maintenance (months)
orifices (CHOTOs)	**50**				
propeller meters	**None**				
weirs	**425**	**Unknown**	**Unknown**	**Unknown**	**Unknown**
flumes	**None (usable)**				
venturi meters	**None**				
pump, run time	**None**				
pump, KWH	**N/A**				
TOTAL	**475**				

Describe the District's water-use data accounting procedures, including how records are kept and archived, availability of water use data to customers, and how many years of customer water use records are available. **The District maintains both hard copies and computer "back-up" tapes of water use records. Hard copies of these records are kept indefinitely. Records of water use are made available to each customer upon request.**

O. Water Pricing and Billing Practices

A copy of the District's written operating rules and regulations will suffice if they include the information requested below.

Describe the District's agriculture water charges (include per-acre assessments, stand-by changes, quantity charges, etc.), and dollar amounts. If water use is billed by quantity describe the rate structure (e.g., declining, uniform or increasing block). **The source of funds for the operation and maintenance of the project, as well as repayment of the construction debt, is from the collection of assessment charges and from water delivery charges. A per acre assessment called a Class A assessment is charged against all irrigated acreage in the Project. Class A assessment notices are mailed to landowners each spring, usually by March. The landowner or operator must pay the assessment and buy water before water delivery is made. The water user has the option of paying all the assessment or of paying half of the assessment before water is ordered and delivered. The other half of the assessment is due by June 30th of each year. A late penalty of 1% per month is charged on all past due assessments.**

In addition, a Class B assessment is levied on all real property within the District not classified as Class A land. The County collects this tax when the property owner pays his taxes. The County then transfers the funds to the District with the District paying the County a collection fee.

The District also charges water users a delivery charge for water used. This charge must be paid before water is ordered and delivered. To promote water conservation, the Board normally sets a higher price for allocations made after the initial allocation.

Describe District's billing practices, include billing frequency, required pre-payments, late charges, etc. **As stated above, the District requires that at least one half of the assessment be paid before any water is ordered and delivered to the water user. This payment entitles the user to buy and use at least half of the water allocation on land on which the assessment has been paid. The other half of the assessment is due by June 30th, with a penalty assessed on any past due accounts. Additionally, water must be bought and paid for before water is ordered and delivered.**

P. *Water Shortage Allocation Policies*

A copy of the District's annual operation and maintenance program will suffice if it includes budgets, schedules, priorities and goals.

Describe (or attach) District's agricultural water shortage policies that include: How reduced water supplies and hardship water are allocated. **The Arch Hurley Conservancy District does not have an alternative water source in case of a severe water shortage. The Board of Directors must rely on rationing the water when they anticipate the possibility of a shortage. In the past, the Board of Directors has followed the policy of placing water users on a rotation basis when the water level in the lake dropped to a level at which the amount of water flow could not meet the demand. Water delivery was made in the order that water requests were received. Arch Hurley also has the right to pump from the "pumping pool" with the bottom of the "emergency pumping pool" being at elevation 4152.5. The flow line of the Conchas canal is at elevation 4157.35.**

Describe (or attach) District policies that address wasteful use of water. Include information on enforcement methods. **The District Board of Directors encourages all water users to apply water to fields as efficiently as possible. All water users are encouraged to use water in accordance with state water laws mandating beneficial use. The Board of Directors plans to develop an information and education program to assist water users in efficient application methods. Some of these programs are planned in cooperation with USDA agencies such as the Natural Resources Conservation Service. As shown elsewhere in this plan, the District makes ISC low interest loans available to water users for the application of practices that result in water conservation.**

Q. *Operation and Maintenance Program*

If all the information listed below is included in the District's written policies, attach the policies and reference the appropriate sections in the blanks below.

Describe the District's operation/maintenance program for the current year, include budget and staff time. **The Year 2001 budget for operation and maintenance is $1,066,342.00. This figure includes funds budgeted for administrative expenses and direct operation and maintenance expenses. The District fiscal year is the same as the calendar year. The District employs about 28 employees.**

Describe the District's water allocation policy. **The Board of Directors sets the water allocation each year, usually in February; the amount based on water storage in Conchas Lake. Normally, an initial allocation of 18 acre inches per acre is made. The Board monitors the water storage and additional allocations are made throughout the summer depending on need and water availability. Additional allocations beyond the initial allocation are usually billed for at a higher rate.**

Provide the minimum lead time necessary for agricultural-water orders. **District policy is that water orders for delivery the following day must be in the office by 9:00A.M. Orders must be placed at least 24 hours in advance of expected delivery.**

Provide the minimum lead time necessary for agricultural-water shut-off requests. **Water shut-off orders must also be made 24 hours in advance of expected shut-off. Requests must be made by 9:00A.M. for shut-off the following day.**

Describe the District's return-flows policy for agricultural water. **Return flows are under the control of the District. With the exception of a small amount of water pumped from Tucumcari Lake, no use is being made of return flows. The water pumped from Tucumcari Lake is quite insignificant and is being pumped only because the District is under a court order to maintain the lake at a certain level.**

Describe the District's policies on water transfers. **It is District policy that water may be transferred from one farm unit to another by agreement of the landowners. The transfer agreement must be in writing, with a copy at the District office, before the water transfer is allowed.**

Step 2. Inventory Water Resources

Some data called for in these Criteria may not be available. Include in the plan how the District will gather those data and have them available for the next plan update.

The inventory of water resources considers the quantity and quality of water sources, the amounts and kinds of water uses within a District and the quantity and quality of drainage from the District. It is recommended that such information be presented in the form of an overall water budget.

A. Water Budget Tables

Develop a **2000** water budget for the District by entering the necessary data in the Tables.
Refer to Appendix A for Tables.

1. Quantify District Water Supplies
   a. All surface water, imported and originating within the District, by month. Table 1
   b. Ground water extracted by the District, by month. Table 2
   c. Estimated ground water extracted by District customers (if records are not available, provide an estimate and basis for estimation). Table 2
   d. Effective precipitation, by month. Table 3
   e. Reclaimed water used, by month. Table 3

2. Quantify Water Used
   a. Conveyance losses, include seepage, evaporation, and operational spills. Table 4
   b. Crop evapotranspiration, and water used for leaching and/or cultural. Table 5
   c. Consumptive use by riparian vegetation in open canals. (estimated) Table 6
   d. Consumptive environmental use. Table 6
   e. Ground water recharge. Table 6
   f. Water exchanges or transfers. Table 6
   g. Water leaving the District, if any. Table 6

3. Overall Water Budget Table 6

B. *Quality of Water Sources*

Describe any water quality monitoring programs for surface water.

analysis performed	concentration range	concentration average	frequency
N/A			

Describe any water quality monitoring programs for ground water.

analysis performed	concentration range	concentration average	frequency
N/A			

Describe any surface or ground water quality problems, and if any, how the quality problems affect the management of source water. **The irrigation water from Conchas Lake is of good quality with no known quality problems.**

C. *Water Uses within the District*

1. *Agricultural*

To document District crop acreages and water used, complete Table 5. Include information on crops grown and acreage, ET_c (season), leaching requirements, and cultural requirements of each crop.

2. *Ground Water Recharge*

Provide the water quantities recharged at District recharge areas (as identified in Step 1 I).

Name	1996 recharge (AF)	Est. 2000 recharge (AF)
N/A		
TOTAL		

Transfer the TOTAL 1996 Water Used for Recharge to Table 6.

Yearly amount recharged (AF)

1976	1981	1986	1991	1996	average
N/A					

3. *Transfers and Exchanges* (into and out of District)

from whom	to whom	1980 (AF)	1990 (AF)	2000(AF)	Use
AHCD	**Various**	**Unknown**	**263**	**212**	**Municipal and Rec.**
TOTAL			**263**	**212**	

Transfer the Net quantity of 1996 Water Transfer/Exchanges to Table 6.

D. Quantity and Quality of Drainage from the District

If return flows leave the District's service area and are reused, identify the location and type of that reuse, if known.

location of reuse	type of reuse	2000 (AF)
N/A	**N/A**	
	TOTAL	

Transfer the TOTAL 1996 return flows leaving the District to Table 6.

Describe any water quality monitoring programs for surface or subsurface drainage water.

analyses performed	concentration range	concentration average	frequency
None			

Identify any known constituents that limit agricultural, environmental, etc. reuse of the drainage water.

constituent	usage limitation
None	

Step 3. Water Management Problems, Opportunities and Conservation Goals

Base the goals of the plan on an evaluation of water management problems associated directly with District operations (i.e., water supply, distribution, control structures, measurement capability, system capacity, operational policies, on-farm program coordination, etc.).

Establishment of definite goals with measurable objectives is fundamental to an effective water conservation program. Define goals in such a way as to allow achievements to be measured.

A. Describe the District's water management problems and challenges

1. Water Loss

Arch Hurley has made several initiatives recently to improve water management. They have realized a need to provide real time potential evapotranspiration (PET) information for District lands in order to more efficiently schedule water deliveries. They would like to enter into an agreement with USBR to install a weather station monitoring network and link the data to the State Climatologist website. Arch Hurley has also realized a need to evaluate and improve the Districts water measurement program in order to improve the quality of their data collection efforts. They would like to enter into a second agreement with USBR to inventory important water measuring devices, identify deficiencies, and implement a cooperative improvement program to replace or retrofit defective measuring devices.

The water budget analysis helped identify some key problems in the District. Average system delivery efficiency to the farm is about 51.5%. This means that if the farms in the District require 40,000 acre feet, as in a typical year, 77,670 acre feet have to be released from Conchas Reservoir - a loss of 37,670 acre feet per year. Seepage and evaporation in the Conchas Canal is estimated to account for 75% of this loss while the other 25% is lost within the remainder of the system. Loss occurs at the reservoir in the form of evaporation at the rate of 25,000 acre feet for an average of 48 years. Nothing can be done about this loss, but it needs to be figured out of the reserve water held in the lake.

The canals and laterals have a severe water loss problem as evidenced by comparing water measurement at the dam and at the farm turnout. The most severe seepage problems are manifested by the aquatic vegetation growing adjacent to the canal embankments in many places. An obvious opportunity exists in reducing the loss of water in the Conchas Canal from the Reservoir to the District. Comparing water released at the reservoir to water entering the District with accurate measuring devices would quantify the extent of the loss in the canal. Measurement at other strategic locations in the system, such as at unit boundaries or major turnouts, would help pinpoint the location and extent of these losses for potential remediation. This tactic would also improve the management of the water, not only in the Conchas Canal but within the seven units as well.

Besides seepage losses in the canal and laterals, inability to adequately control the water within the canal system, as evidenced by spillage or low water levels in the canals, is a factor in losses within the system. Accurate measurement would assist field personnel in maintaining a steady flow. Training of field personnel in basic hydraulics would also be beneficial in ensuring better water management.

A significant portion of within system loss is apparent in the sub-laterals. Additional water has to be released due to the excess seepage and poor condition of the sub-laterals. Comparing the amount of water released into these small unlined laterals to the water delivered to the farm turnout would quantify the magnitude of the loss and thus help justify improvements. Converting these sub-laterals to pipe might be more cost effective than concrete lining. In addition, it is important that all the measuring devices at the farm turnout are present and maintained properly to ensure accurate measurement.

2. System Operation and Maintenance

The main canal and laterals, over the years, have lost any semblance to the originally designed trapezoidal-shaped cross-sections. They have become extremely wide in some places. This results in greater seepage potential and also higher potential for embankment failure because of narrower embankments. This has been caused, in part, by the practice of using bucket-wielding equipment to remove vegetative growth on the canal banks and even within the canal. Naturally, this process removes portions of the original embankment. Other methods of vegetative control, such as subsurface mowers, establishing low maintenance vegetation, , aquatic herbicides, and canal lining are possible remedies.

Another problem apparent in the District is deferred maintenance. Large trees, while esthetically pleasing, pose some major problems. They consume a certain amount of water, but of more importance, threaten the very integrity of the canal and lateral embankment itself. The trees need to be removed and the integrity of the embankment reestablished. Some laterals are inaccessible due to steep slopes or fences. This is a deterrent to efficient maintenance.

3. Irrigation Efficiency

The on-farm irrigation efficiency is obviously low. Significant field runoff, persistent "swampy" areas in the fields, dry spots, and highly variable crop size in the fields indicate problems. Crop yields are lower than the potential for the area.

On-farm efficiency can be improved in many ways: on farm recovery ponds; land leveling; proper irrigation techniques; field preparation; proper stream size; system conversion to gated pipe, surge, sprinkler, or drip; timing, and amount. The feasibility of improving irrigation efficiency in the Tucumcari Project should definitely be considered as a future goal.

4. *Summary of Water Management Problems and Challenges*

In summary, there are many problems which present opportunities to reduce water loss in the delivery system and to improve on-farm irrigation efficiency. These problems are summarized as follows:

1. Water Loss

Symptoms:

- Difference in water released versus water delivered.
- Aquatic vegetation alongside canals and within the canals.
- Wet sub-irrigated areas in fields.
- Seepage from canals and laterals.
- Large amount of carry water needed for some sub-laterals.

2. System Operation and Maintenance

Symptoms:

- Some on-farm measurement devices in disrepair or non-existing.
- Maintenance equipment in need of replacement.
- Operational vehicles in need of replacement.
- Fences and other obstructions across canal banks.
- Oversized canals and laterals.
- Excess and large vegetative growth within and along canals.
- Sediment deposition in canals.
- Eroded and rough sub-laterals.
- No significant capital improvements initiated in recent years.
- Serious farm income short-falls restricting farmers ability to pay for improvements.

3. Irrigation Efficiency (water application methods)

Symptoms:

- Uneven crop growth.
- Low yields.
- Field runoff.

B. *Describe the District's water management goals*

Water management and conservation efforts should be a means of achieving specific goals such as: saving money, increasing production, reducing soil erosion, eliminating drainage problems, improving water supply and deliver reliability and freeing up water supplies for additional uses.

1. Reduce System Water Loss to Less Than 40% of Gross Diversions by the Year 2020

Objectives:

- Implement a measurement program starting in the 2001 off-season with the installation of one accurate measurement device per year at critical locations in the delivery system to support future improvements in District water management.
- Train ditch riders in basic hydraulics and water management during every off-season.
- Evaluate the financial feasibility of small laterals improvement starting in the 2001 off-season.
- Evaluate water quality from Tucumcari Lake and do a feasibility study of pumping water from Tucumcari Lake and Dry Lake.
- Implement a 10-year delivery system improvement program in the 2001 off-season to re-size the most critical delivery canals and laterals based on delivery requirements. The use of dredging equipment should also be reduced in favor of alternative methods of weed control such as: mowing, grazing and herbicides.
- Make use of the Wye Regulating Reservoir.
- Evaluate concrete lining or installing pipe in the most critical reaches of the delivery system starting in the 2002 off season.

2. Improve System Operation and Maintenance

Objectives:

- Replace defective or non-existent measuring devices at farm turnouts starting during 2000+ off-season.
- Evaluate and prioritize critical maintenance requirements for the water delivery system and maintenance equipment in 2000+.
- Have canal maintenance training for all equipment operators.

3. Promote on Farm Irrigation Efficiency

Objectives:

- Offer on-farm irrigation water management and training seminars to improve irrigation efficiency starting in 2000+, in conjunction with other agencies.
- Initiate on-farm tail water recovery system feasibility starting in the year 2000+.
- Encourage use of the Interstate Stream Commission water conservation loan program by farmers to improve on-farm irrigation efficiency.
- Develop drought contingency plan in the year 2000+.

4. Develop Financing to Provide for High Cost Water Conservation Practices

Objectives:

- Determine and quantify District fiscal needs by December 2001 to initiate an overall District improvement plan. This would include a feasibility and cost estimate of the objectives of this plan.
- Initiate an aggressive grant search program and apply for at least one private and one government grant annually.
- Partner with USDA-Agencies and related agencies in the Department of the Interior on a continuing basis to reinstate cost sharing funds.
- Participate in USBR Water Conservation Field Services Program on an annual basis to implement water management measures such as water measurement, and small lateral improvement.

5. Education and Information

Objectives:

- News releases by manager and Board on a monthly or bi-monthly basis.
- Presentations to local groups on Arch Hurley activities.
- Show-me trips of canal operations to the interested parties.
- Traveling exhibition of photo history of AHCD to local fairs, etc.

Step 4. Existing Water Conservation Measures

Evaluate and identify how existing water management efforts have worked in relation to the District evaluation of problems, opportunities and goals. Include a description of measures implemented previously and the results achieved.

A. List of the practices and expected results that were identified and implemented previously.

practice	expected result
Yearly allotment set By the Board	**More efficient use of water resources when need, availability, and current conditions can be evaluated by people familiar with the area**
Water releases adjusted on a daily basis	**More accurate and conservative use of water**
Public input	**Added knowledge and ideas**
Ditch Lining(Project)	**Water conservation by Irrigation Project.**
Ditch Lining (Fields)	**Water conservation by water users.**
ISC low interest loans	**Soil and water conservation by water users.**
Repair and Installation of Measurement devices	**Better measurement resulting in water conservation.**
Conversion of open ditches to pipelines	**Water conservation by Irrigation Project.**
Irrigation Pipelines (fields)	**Water Conservation by water users.**
Ditch rider in-field Trng.	**Better water management resulting in water conservation.**
Legislative grants to buy equipment	**Better operation and maintenance resulting in soil and water conservation.**
Weed, Brush and Tree control (mechanical and chemical)	**Water conservation**

The District borrows funds from the ISC and re-loans the money for the installation of conservation practices by water users.

B. Description of the actual program design and results of practices that were implemented previously.

program design	summary of actual results
ISC loans to farmers	**Improved on farm efficiency**
Safety fencing and radio PSA	**Fewer accidents with local children**
Mechanical tree and brush control	**Reduced water loss to vegetation**
Release of news and safety training articles	**Increased public awareness**
Ditch rider in-field training	**Improved customer satisfaction and less loss due to spillage**

Step 5. Fundamental Water Conservation Measures

Address how the District has implemented, or could implement, each of the following four fundamenta measures.

A. Water measurement and accounting system designed to measure and account for the water conveyed through the District distribution system to water users.

Describe the District's current measurement and accounting system. **Overall, the Arch Hurley Conservancy District has a good accounting system for irrigation water. The Corps of Army Engineers measures the water delivery at the head of the Conchas Canal. The method of measurement is by flow meters. Arch Hurley meters all the water at each farmer's turnout (turnouts). As shown elsewhere, Arch Hurley maintains records furnished by the Army Corps of Engineers of the water deliveries at Conchas, as well as records of water deliveries to the water users.**

If the current system does not measure/account for the volume of water conveyed to individual users, describe the District's planned changes to its measurement and accounting system. **There are some weaknesses in the water measurement of the irrigation water for the District that Arch Hurley intends to correct as funds are available. There is a need for a water measurement device at the delivery point where the main canal enters the Project. This would allow the District to determine the amount of losses for the approximately 39 miles of canal from Conchas to the point at which the first delivery turnout is located within the District. Another need is for better water measurement, on the main canal, at the division points between ditch rider units. The present method is more of an estimate than an accurate water measurement. Still another additional need is for installation of water measurement devices at many of the turnouts. An inventory made several years ago determined that there are at least 100 delivery points that have no measuring devices or measuring devices that don't measure water properly.**

The Arch Hurley office staff has identified a need for new software for maintaining water records by computers currently in use. This is a high priority item that needs to be addressed as soon as possible

B. A water pricing structure that encourages efficiency improvements by water users.

Describe the District's current pricing structure and how it promotes efficiency.
The current pricing system is based on quantity. Further, the District has a multi-tiered pricing system to encourage cooperators to make more efficient use of irrigation water.

If the District's current pricing structure is not based, at least in part, on the quantity of water delivered, describe the District's planned changes to its pricing structure to encourage efficient water use. **No changes are planned in the pricing structure. Current programs will continue.**

C An information and education program for users designed to promote increased efficiency of water use.

Describe the District's current information and education program. **Water delivery policies have been developed over the years and were published for the public and area landowners in 1990 in a booklet entitled "Water Rules and Information." The District also releases news articles and safety training articles.**

If the District's current information/education program does not disseminate information to customers on efficient water use and conservation services available from the District and others, describe the District's planned changes to its education program. **The District plans to continue the current program of information distribution. It will also work to incorporate the objectives discussed in Goal Five.**

D. A water conservation coordinator

Name **Harold Horlacher** Title **District Manager**

Phone **(505) 461-2351** Fax **(505) 461-4061** E-mail **hootie.ahcd@shipleysystems.com**

Step 6. Additional Water Conservation Measures

Evaluate potential measures that may be suitable for improved water management and water use efficiency within the District. This evaluation is key to the water conservation planning process. If a measure will be implemented, describe the District's program.

Describe the evaluation process for each measure. If a measure is selected for implementation, describe the goals and scope of the project. If more data must be collected before a decision to implement or exclude a measure can be made, describe the District's plan to collect the necessary data. If a measure was not selected for implementation, describe the data and thought process which supports its exclusion.

A. Agricultural Water Conservation Measures

1. On-farm program incentives - **Facilitate and/or provide financial incentives and assistance for on-farm water use efficiency improvements (e.g., lease, low interest loans, or water charge rebates for on-farm conservation measures).**

Current Program: **Current program consists of Interstate Stream Commission, low interest loans, available to all interested farmers.**

Identification of District specific program designs: **Program is already being carried out and will be continued as long as funds are available.**

Evaluation of specific designs: **None needed.**

Description of goals and scope of specific program: **Program is to be continued.**

2. Drought/water shortage contingency plan: **Develop a drought/water shortage contingency plan for the District that outlines policies and procedures for operation and allocation during water supply shortages.**

Current Program: **Current program is as shown in Step1, (P):**
It consists of water rationing whenever a shortage of water is anticipated. The District also has the right to pump from the "pumping pool" when the water level in the lake reaches a point where gravity flow does not occur. Lake elevations are monitored at all times and information is provided to the Board of Directors at each meeting.

Identification of District specific program designs: **Current drought plan will be continued.**

Evaluation of specific designs: **No other alternative is known at present and program will be re-evaluated if a more suitable alternative is found.**

Description of goals and scope of specific program: **Current program will be continued.**

3. Water transfers: **Facilitate voluntary water transfers that do not unreasonably affect the District, the environment, or third parties. The current program is as shown in Step 1, (P). Water transfers amongst farmers is permitted with special conditions.**

Current Program: **The current program is as shown in Step 1, (P).**

Identification of District specific program designs: **Water transfers are permitted amongst cooperators under conditions as shown in Step 1.**

Evaluation of specific designs: **None needed.**

Description of goals and scope of specific program: **Current program to be continued until a more suitable alternative becomes known.**

4. Conjunctive use: **Where appropriate, increase conjunctive use of surface and groundwater within the District, and work with appropriate entities to develop a groundwater management plan.**

Current Program: **No program presently being followed.**

Identification of District specific program designs: **There is a possibility of more wells being developed within the boundaries of the Entrada Aquifer.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **No program planned until such time as underground water from the Entrada Aquifer is available.**

5. Land management: **Facilitate potential alternative uses for lands with exceptionally high water duties, or whose irrigation contributes to significant problems (e.g., drainage that precludes attainment of water quality standards).**

Current Program: **Farmers are encouraged to plant crops based on water availability and soil suitability.**

Identification of District specific program designs: **No specific designs by the District since this is a matter better left to individual farmers.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **No anticipated changes to present program.**

6. Operational practices and procedures: **Evaluate potential District operational policy and institutional changes that could allow more flexibility in water delivery and carry-over storage.**

Current Program: **Current program encourages higher efficiency and minimizing water losses.**

Identification of District specific program designs: **Better training and retention of employees. Emphasis is also on upgrading equipment.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **Greater emphasis will be placed on improving current program. Program will be limited only by availability of funds.**

7. Distribution system scheduling: **Implement a program of distribution system scheduling based on area-wide crop demand modeling or advanced ordering requirements.**

Current Program: **None.**

Identification of District specific program designs: **None proposed.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **N/A**

8. On-farm irrigation scheduling: **Facilitate the delivery of crop water use and on-farm water delivery information to District customers for on-farm irrigation scheduling.**

Current Program: **None.**

Identification of District specific program designs: **District proposes to set up information programs, in cooperation with USDA agencies, to provide assistance to farmers on water management.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **Information will be provided to farmers by all means possible.**

9. Pump efficiency evaluations: **Coordinate the evaluation of District and private pumps with local utilities, evaluating both energy and water efficiency.**

Current Program: **None.**

Identification of District specific program designs: **None.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **N/A**

10. Distribution control: **Modify distribution facilities and controls to increase the flexibility of water deliveries (e.g., automate canal structures, institute variable turn-off times, etc.).**

Current Program: **None.**

Identification of District specific program designs: **To be considered in the future.**

Evaluation of specific designs: **N/A**

Description of goals and scope of specific program: **N/A**

11. Reuse systems: **Construct District operational spill reuse systems.**

Current Program: **Current program consists of trying to avoid spills.**

Identification of District specific program designs: **Operation of the project in such a way to prevent leaks in the system.**

Step 7. Selected Measures and Projected Results

Identify those measures to be implemented by the District and address methods for monitoring results of those measures.

List the water conservation measures that will be implemented by the District. In Step 9 describe how the results of each measure will be monitored.

Conservation Practice - **New water records software for computer.**

Conservation Practice - **Replace defective measuring devices at farmers' turnouts. Install measuring devices where none exist.**

Conservation Practice - **Install accurate measuring devices at county line check and at WYE. Install accurate measuring devices at division points of each ditch rider unit.**

Conservation Practice - **Improve small open laterals by ditch lining or underground pipelines where feasible.**

Conservation Practice - **Re-size canals and laterals as part of regular maintenance.**

Conservation Practice - **Re-activate use of regulating reservoir at WYE after building foot bridge across main canal.**

Step 8 Environmental review

Identify and evaluate the potential for environmental effects (both positive and negative) of implementing the plan. Although the preparation of a water conservation plan by a District is not a Federal action, and in and of itself is not subject to NEPA or ESA compliance, a water conservation plan includes consideration of the environmental effects of the selected water conservation measures as a part of the planning process.

Compliance with the National Environmental Policy Act (NEPA) is not required for the development of this water conservation plan, because no federal action is occurring. However, subsequent implementation of actions proposed in this plan that require a federal action (funding, permitting, approvals, improvements to the Tucumcari Project, etc...) must comply with NEPA and other federal environmental laws. This compliance would be conducted in coordination with the Bureau of Reclamation.

Step 9. Implementation schedule and budget for each selected measure

Provide a schedule and a budget for implementation of the water conservation program. An implementation schedule needs to address the sequence and allotted time for specific actions to carry out the plan. This includes the schedule for implementing each water conservation measure selected by the District, as well as a means for monitoring the performance of completed measures. Include the budget and staffing to be committed by the District for implementing the plan. Append to the completed plan a resolution approving the plan that was adopted by the District's governing body.

Complete the following for each selected practice.

Year 1 (2001)

Best Management Practice: **Replace water records software.**

Proposed monitoring activities: **Report practice completed when software has been replaced and is operating properly.**

Proposed staff hours _____ Proposed budget **$25,000.00**

Year 2 (2002)

Best Management Practice: **Line small laterals with concrete and/or replace open ditches with pipelines.**

Proposed monitoring activities: **Report miles of laterals completed.**

Proposed staff hours _____ Proposed budget **$37,000.00**

Additional years' work to be planned and scheduled during budget development with practices being carried out the following years.

APPENDIX A

TABLES

Table 1

2000 – Surface Water Supply

Month acre-feet	USBR Agric. acre-feet	State Project acre-feet	Local Water Supply acre-feet	Upslope Drain Water acre-feet	Total
January					
February					
March					
April	13,850				13,850
May	18,207				18,207
June	16,677				16,677
July	17,341				17,341
August	23,190				23,190
September	20,705				20,705
October	8,274				8,274
November					
December					
TOTAL	118,244				118,244

Transfer the Total Surface Water Supply to Table 3

Table 2

2000 – Ground Water Supply

	Pumped by District			Pumped by District Customers			
Month	Basin 1 acre-feet	Basin 2 acre-feet	Basin 3 acre-feet	Basin 1 acre-feet	Basin 2 acre-feet	Basin 3 acre-feet	Total acre-feet
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							
TOTAL							

Transfer the Total Ground Water Supply to Table 3

Table 3

2000 – Water Supplies

Month	Surface Water acre-feet	Ground Water acre-feet	Effective Precipitation acre-feet	Reclaimed Water acre-feet	Other acre-feet	Total acre-feet
January						
February						
March			2,012			2,012
April	13,850		861			14,711
May	18,207		996			19,203
June	16,677		1,346			18,023
July	17,341		2,611			19,952
August	23,190		296			23,486
September	20,705		81			20,786
October	8,274					8,274
November						
December						
TOTAL	118,244		8,203			126,447

Transfer the Total Water Supply to Table 6

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Table 4

2000 – Conveyance Losses

Reach or Lateral	Length miles	Seepage acre-feet	Evaporation acre-feet	Operational Spills acre-feet	Total Losses acre-feet
TOTAL					58,003

The total loss figure is arrived at by subtracting the measured amount sold to water users from the total amount released at the Lake. (118,244minus 60,241

Transfer the Total Conveyance Losses to Table 6

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Table 5
2000 – Crop Water Needs

Crop	Area crop acres	Growing Season Planting month	Growing Season Harvest month	Crop ET + AF per acre	Leaching Requirement AF per acre	Cultural +Practices AF per acre	Crop = Water Needs acre-feet
Irr. Pasture	14,805						
Alfalfa	8,384						
Cotton	3,807						
Other Hay	2,308						
Wheat	1,649						
all other misc.	1,349						
TOTAL Crop Acres	32,302						

Total Irrigated Acres 32,302 (Due to double cropping Total irrigated Acres is usually less than the Total Crop Acres)

Transfer the Total Crop Water Needs to Table 6

Table 6
2000 - Overall Water Budget

Step 2 A	**2000 Water Supply**	from Table 3		118,244
District Beneficial Uses				
2 A 2 e	Environmental Consumptive Use		minus	
2 C 3	Ground Water Recharge	(planned)	minus	
2 C 4	Water Exchanges or Transfers		plus or minus	
		WATER SUPPLY AVAILABLE FOR USE		60,241
2 A 2 a	Conveyance System Seepage	Table 4	minus	
2 A 2 a	Conveyance System / Reservoir Evaporation	Table 4	minus	
2 A 2 a	Conveyance System Spills	Table 4	minus	
2 A 2 d	Consumptive Use by Riparian Vegetation	(estimate)	minus	
		WATER SUPPLY AVAILABLE FOR SALE TO CUSTOMERS		60,241
		QUANTITY OF WHAT WE ACTUALLY SOLD TO CUSTOMERS		60,241
2 C 1	Crop Water Needs	Table 5	minus	
2 D	Drain/Spill Water Leaving the District	(estimate)	minus	
2D	Deep Percolation	(calculated)	EQUALS	10//****//*0

Note: The 60,241 ac. ft. figure, the amount sold to customers, is actually a measured amount. Actual calculation of the different losses would be impossible to calculate for an irrigation system as large and complicated as this is. Also, estimates would not result in useful information since these figures would be estimated by working backward from the 60,241 figure. If one calculates the water needs of crops grown in the District, one will arrive at the conclusion that the water supply is not adequate. Although the irrigation system has always been called a full irrigation system, a more accurate description would be a limited or supplemental system.

Appendix I - Population and Economic Growth

Quay County City Population, 1910-2000										
	2000	1990 r/	1980	1970	1960	1950	1940	1930	1920	1910
Place	(April 1)	(April 1)	(April 1)	(April 1)	(April 1)	(April 1)	(April 1)	(April 1)	(Jan. 1)	(April 15)
House	72	96	117	119	139	na	na	na	na	na
Logan	1,094	804	735	386	320	na	na	na	na	na
San Jon	306	283	341	308	411	362	na	na	na	na
Tucumcari	5,989	6,872	6,765	7,189	8,143	8,419	6,194	4,143	3,117	2,526
Source: U.S. Department of Commerce, Bureau of the Census.										
Table prepared by: Bureau of Business and Economic Research, University of New Mexico.										

US Census Bureau		
Quick Facts		
Geographic Area: Quay County, New Mexico		
Subject	Number	Percent
Total population	10,155	100
SEX AND AGE		
Male	4,920	48.4
Female	5,235	51.6
Under 5 years	558	5.5
5 to 9 years	695	6.8
10 to 14 years	751	7.4
15 to 19 years	771	7.6
20 to 24 years	442	4.4
25 to 34 years	976	9.6
35 to 44 years	1,390	13.7
45 to 54 years	1,430	14.1
55 to 59 years	651	6.4
60 to 64 years	563	5.5
65 to 74 years	1,024	10.1
75 to 84 years	661	6.5
85 years and over	243	2.4
Median age (years)	41.5	(X)

US Census Bureau		
Quick Facts		
Geographic Area: Quay County, New Mexico		
Subject	Number	Percent
18 years and over	7,614	75
Male	3,639	35.8
Female	3,975	39.1
21 years and over	7,291	71.8
62 years and over	2,254	22.2
65 years and over	1,928	19
Male	854	8.4
Female	1,074	10.6
RACE		
One race	9,876	97.3
White	8,336	82.1
Black or African American	85	0.8
American Indian and Alaska Native	129	1.3
Asian	81	0.8
Asian Indian	60	0.6
Chinese	6	0.1
Filipino	8	0.1
Japanese	1	0
Korean	2	0
Vietnamese	3	0
Other Asian 1	1	0
Native Hawaiian and Other Pacific Islander	15	0.1
Native Hawaiian	5	0
Guamanian or Chamorro	5	0
Samoan	0	0
Other Pacific Islander 2	5	0
Some other race	1,230	12.1
Two or more races	279	2.7
Race alone or in combination with one or more other races 3		
White	8,574	84.4
Black or African American	102	1
American Indian and Alaska Native	216	2.1
Asian	102	1

US Census Bureau		
Quick Facts		
Geographic Area: Quay County, New Mexico		
Subject	Number	Percent
Native Hawaiian and Other Pacific Islander	24	0.2
Some other race	1,419	14
HISPANIC OR LATINO AND RACE		
Total population	10,155	100
Hispanic or Latino (of any race)	3,857	38
Mexican	1,117	11
Puerto Rican	15	0.1
Cuban	0	0
Other Hispanic or Latino	2,725	26.8
Not Hispanic or Latino	6,298	62
White alone	5,953	58.6
RELATIONSHIP		
Total population	10,155	100
In households	9,967	98.1
Householder	4,201	41.4
Spouse	2,188	21.5
Child	2,750	27.1
Own child under 18 years	2,208	21.7
Other relatives	460	4.5
Under 18 years	242	2.4
Nonrelatives	368	3.6
Unmarried partner	193	1.9
In group quarters	188	1.9
Institutionalized population	176	1.7
Noninstitutionalized population	12	0.1
HOUSEHOLDS BY TYPE		
Total households	4,201	100
Family households (families)	2,845	67.7
With own children under 18 years	1,216	28.9
Married-couple family	2,188	52.1
With own children under 18 years	806	19.2
Female householder, no husband present	503	12

US Census Bureau		
Quick Facts		
Geographic Area: Quay County, New Mexico		
Subject	Number	Percent
With own children under 18 years	316	7.5
Nonfamily households	1,356	32.3
Householder living alone	1,215	28.9
Householder 65 years and over	579	13.8
Households with individuals under 18 years	1,361	32.4
Households with individuals 65 years and over	1,350	32.1
Average household size	2.37	(X)
Average family size	2.9	(X)
HOUSING OCCUPANCY		
Total housing units	5,664	100
Occupied housing units	4,201	74.2
Vacant housing units	1,463	25.8
For seasonal, recreational, or occasional use	515	9.1
Homeowner vacancy rate (percent)	4.4	(X)
Rental vacancy rate (percent)	18.9	(X)
HOUSING TENURE		
Occupied housing units	4,201	100
Owner-occupied housing units	2,968	70.6
Renter-occupied housing units	1,233	29.4
Average household size of owner-occupied unit	2.38	(X)
Average household size of renter-occupied unit	2.35	(X)
Source: U.S. Census Bureau, Census 2000 Summary File 1		

Village of House

Demographics						
Population						
	2001	2000	1990	% change	1980	1970
	Census	Census	Census	1990-2000	Census	Census
	Estimates					
House	69	72	96	-15.3	117	119
Quay	9,811	10,155	10,823	-6	10,577	10,903
By Age & Gender - 2000						
	Male	Female	Median age	18 years & over	21 years & over	62 years & over
House	38	34	51.8	57	56	24
Quay	4,920	5,235	41.5	7,614	7,291	1,928
	Under 5	5 to 19	20 to 44	45 to 59	60 to 64	65 & over
Quay - Total	558	2,217	2,808	2,081	563	1,928
Male	282	1,127	1,349	1,033	275	854
Female	276	1,090	1,459	1,048	288	1,074
Sources: Census 2000 Demographic Profile for House , and for Quay County						
US Census Bureau, Census 2000 for New Mexico: www.census.gov/census2000/states/nm.html						
US Census Bureau Population Estimates: http://eire.census.gov/popest/estimates.php						
Geography & Climate (House and Quay County)						
Area in square miles					Density per square mile of land area	
	Total area	Water area	Land area	Elevation	Population	Housing units
House	0.92	0	0.92	4,850	78.3	56.5
Quay	2,881.80	6.87	2,874.93		3.5	2
Source: NMSU Climate Center - www.wrcc.dri.edu/summary/climsmnm.html						

Village of Logan

Demographics						
Population						
	2001	2000	1990	% change	1980	1970
	Census	Census	Census	1990-2000	Census	Census
	Estimates					
Logan	1,071	1,094	804	25.7	735	386
Quay	9,811	10,155	10,823	-6	10,577	10,903
By Age & Gender - 2000						
	Male	Female	Median age	18 years & over	21 years & over	62 years & over
Logan	539	555	48	862	841	297
Quay	4,920	5,235	41.5	7,614	7,291	1,928
	Under 5	5 to 19	20 to 44	45 to 59	60 to 64	65 & over
Quay - Total	558	2,217	2,808	2,081	563	1,928
Male	282	1,127	1,349	1,033	275	854
Female	276	1,090	1,459	1,048	288	1,074
Sources: Census 2000 Demographic Profile for Logan , and for Quay County						
US Census Bureau, Census 2000 for New Mexico: www.census.gov/census2000/states/nm.html						
US Census Bureau Population Estimates: http://eire.census.gov/popest/estimates.php						

Geography & Climate (Logan and Quay County)						
Area in square miles					Density per square mile of land area	
	Total area	Water area	Land area	Elevation	Population	Housing units
Logan	8.43	0.47	7.96	4,096	137.5	126.9
Quay	2,881.80	6.87	2,874.93		3.5	2
Source: NMSU Climate Center - www.wrcc.dri.edu/summary/climsmnm.html						

Village of San Jon

Demographics						
Population						
	2001	2000	1990	% change	1980	1970
	Census	Census	Census	1990-2000	Census	Census
	Estimates					
San Jon	295	306	288	10.5	341	308
Quay	9,811	10,155	10,823	-6	10,577	10,903
By Age & Gender - 2000						
	Male	Female	Median age	18 years& over	21 years & over	62 years & over
San Jon	131	175	36.3	212	203	52
Quay	4,920	5,235	41.5	7,614	7,291	1,928
	Under 5	5 to 19	20 to 44	45 to 59	60 to 64	65 & over
Quay - Total	558	2,217	2,808	2,081	563	1,928
Male	282	1,127	1,349	1,033	275	854
Female	276	1,090	1,459	1,048	288	1,074
Sources: Census 2000 Demographic Profile for San Jon , and for Quay County						
US Census Bureau, Census 2000 for New Mexico: www.census.gov/census2000/states/nm.html						
US Census Bureau Population Estimates: http://eire.census.gov/popest/estimates.php						

Geography & Climate (San Jon and Quay County)						
	Area in square miles				Density per square mile of land area	
	Total area	Water area	Land area	Elevation	Population	Housing units
House	2.63	0	2.63	4,230	116.5	50.6
Quay	2,881.80	6.87	2,874.93		3.5	2
Source: NMSU Climate Center - ww.wrcc.dri.edu/summary/climsmnm.html						

City of Tucumcari

Demographics

Population

	2001	2000	1990	% change	1980	1970
	Census	Census	Census	1990-2000	Census	Census
	Estimates					
Tucumcari	5,711	5,989	6,872	-12.3	6,765	7,189
Quay	9,811	10,155	10,823	-6	10,577	10,903
By Age & Gender - 2000						
	Male	Female	Median age	18 years & over	21 years & over	62 years & over
Tucumcari	2,852	3,137	39.4	4,432	4,215	1,046
Quay	4,920	5,235	41.5	7,614	7,291	1,928
	Under 5	5 to 19	20 to 44	45 to 59	60 to 64	65 & over
Quay - Total	558	2,217	2,808	2,081	563	1,928
Male	282	1,127	1,349	1,033	275	854
Female	276	1,090	1,459	1,048	288	1,074

Sources: Census 2000 Demographic Profile for Tucumcari , and for Quay County

US Census Bureau, Census 2000 for New Mexico: www.census.gov/census2000/states/nm.html

US Census Bureau Population Estimates: http://eire.census.gov/popest/estimates.php

Geography & Climate (Tucumcari and Quay County)

	Area in square miles				Density per square mile of land area	
	Total area	Water area	Land area	Elevation	Population	Housing units
Tucumcari	7.56	0.01	7.54	4,086	793.8	406.2
Quay	2,881.80	6.87	2,874.93		3.5	2

Source: NMSU Climate Center - www.wrcc.dri.edu/summary/climsmnm.html

Projected Population: New Mexico Counties							
2000 to 2030 (as of July 1)							
County	2000	2005	2010	2015	2020	2025	2030
Total	1,826,280	1,970,982	2,112,957	2,251,249	2,382,999	2,507,378	2,626,333
Bernalillo	558,437	595,954	631,839	666,114	698,832	729,750	759,000
Catron	3,567	3,829	4,063	4,275	4,459	4,616	4,752
Chaves	61,453	63,295	64,864	66,311	67,591	68,560	69,251
Cibola	25,683	26,753	27,681	28,479	29,157	29,732	30,231
Colfax	14,230	14,767	15,223	15,595	15,843	15,967	15,981
Curry	45,085	46,059	46,973	47,723	48,190	48,322	48,168
De Baca	2,241	2,270	2,289	2,293	2,296	2,295	2,296
Dona Ana	175,524	197,410	218,523	238,044	255,057	270,761	286,741
Eddy	51,736	53,514	55,274	56,948	58,514	59,908	61,066
Grant	31,083	32,462	33,769	34,920	35,886	36,758	37,657
Guadalupe	4,696	5,010	5,304	5,555	5,748	5,887	5,989
Harding	828	805	780	754	726	697	676
Hidalgo	5,929	5,872	5,781	5,676	5,554	5,399	5,203
Lea	55,490	55,108	54,551	53,709	52,556	51,121	49,417
Lincoln	19,585	21,798	23,792	25,556	27,100	28,466	29,715
Los Alamos	18,359	18,720	19,114	19,574	20,060	20,494	20,749
Luna	25,189	28,638	32,206	35,888	39,512	42,963	46,328
McKinley	75,072	81,484	88,163	95,044	101,750	108,316	114,854
Mora	5,205	5,704	6,205	6,694	7,137	7,526	7,862
Otero	62,553	64,851	67,018	68,896	70,508	71,981	73,348
Quay	10,142	10,114	10,030	9,888	9,659	9,343	8,986
Rio Arriba	41,307	43,132	45,058	46,953	48,630	49,975	50,996
Roosevelt	18,075	19,117	20,197	21,238	22,159	22,985	23,773
San Juan	114,272	121,445	128,592	135,497	142,074	148,315	154,403
San Miguel	30,249	32,513	34,746	36,876	38,847	40,612	42,190
Santa Fe	129,936	143,987	158,624	174,400	191,403	208,801	226,012
Sierra	13,355	15,065	16,723	18,328	19,857	21,301	22,672
Socorro	18,165	19,802	21,421	23,000	24,493	25,864	27,137
Taos	30,154	32,651	35,097	37,400	39,442	41,191	42,678
Torrance	17,029	19,523	21,690	23,475	24,979	26,318	27,479
Union	4,177	4,280	4,365	4,439	4,507	4,563	4,619
Valencia	66,699	76,512	86,708	97,330	108,064	118,593	128,922

Projected Population: Quay County								
2000 to 2040								
Census Estimates								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	10,114*	10,030*	9,888*	9,659*	9,343*	8,986*	8,629
House	72	72	71	70	68	66	64	61
Logan	1094	1090	1081	1065	1041	1007	968	930
San Jon	306	305	302	298	291	282	271	260
Tucumcari	5989	5965	5915	5832	5696	5510	5300	5089
Balance of Quay County	2694	2683	2661	2623	2562	2479	2384	2289
Slow Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	10257	10359	10463	10567	10673	10780	10888
House	72	73	73	74	75	76	76	77
Logan	1,094	1105	1116	1127	1138	1150	1161	1173
San Jon	306	309	312	315	318	322	325	328
Tucumcari	5,989**	6049**	6109**	6170**	6232**	6294**	6357**	6421
Balance of Quay County	2,694	2721	2748	2776	2803	2831	2860	2888
Medium Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	10663	11196	11756	12343	12961	13609	14289
House	72	76	79	83	88	92	96	101
Logan	1,094	1149	1206	1266	1330	1396	1466	1539
San Jon	306	321	337	354	372	391	410	431
Tucumcari	5,989**	6288**	6603**	6933**	7280**	7644**	8026**	8427
Balance of Quay County	2,694	2829	2970	3119	3275	3438	3610	3791
Fast Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
Quay	10,155*	11171	12288	13516	14868	16355	17990	19789
House	72	79	87	96	105	116	128	140
Logan	1,094	1203	1324	1456	1602	1762	1938	2132
San Jon	306	337	370	407	448	493	542	596
Tucumcari	5,989**	6588**	7247**	7971**	8768**	9645**	10610**	11671
Balance of Quay County	2,694	2963	3260	3586	3944	4339	4773	5250

Appendix J

Stream flow Information

Sanchez Gage												
YEAR	Monthly mean stream flow, in ft3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1912										26.1	34.5	25.6
1913	36.4	58.5	35.6	30.4	5.16	3,777	239	96.1	56.7	149	44.2	56.9
1914	180	56.9	37	146	1,991	545	1,129	778	104			
1936				0	33.4	225	95.8	95.7	72.9	16.5	5.83	12.6
1937	10.7	22	9.87	36.6	249	2,104	320	102	292	7.23	7.4	11.9
1938	35.8	30	9.42	0.87	24.8	892	386	156	775	537	58.4	46.5
1939	69.9	102	110	204	83.5	132	76.2	414	88.2	19.3	10.2	17.6
1940	16.8	41.6	35.2	10.5	46.8	42	12.9	252	58	14.3	18.3	61.9
1941	57.1	86.4	261	544	4,721	1,653	912	662	1,824	870	506	252
1942	164	109	110	5,573	1,771	417	197	327	4,079	682	295	178
1943	183	166	125	61.9	89.9	38.2	94.7	236	40.9	35.8	55.4	63.2
1944	61.5	117	64.8	155	753	298	189	173	26	179	81.7	60.8
1945	67.7	76	50.3	46.7	149	39.3	66.4	366	67.6	22	29.6	27.7
1946	35.7	48.8	50	9.07	1.71	17.6	13.9	1,173	581	525	84.3	49.2
1947	35.6	27.8	18.2	10.9	314	74.6	700	183	17.4	14.2	18	31.9
1948	43.6	235	203	147	333	1,057	102	122	3.1	2.94	27.6	28.6
1949	25.1	44.3	23.8	25.1	274	543	349	218	203	31.1	35.1	32
1950	38.5	27.6	9.71	1.17	0.16	29.1	625	370	260	34.7	14.1	19.7
1951	22.1	24.4	9.03	13.1	223	32.6	354	635	13.4	10.6	15.5	16.5
1952	14.2	12.2	7.83	7.25	43.2	19.3	88.3	970	295	26.7	19.4	39.2
1953	37	26.9	14.1	1.7	27.9	47.1	400	495	353	3.77	23.5	23.7
1954	25.8	17.4	3.1	0	3.61	2.27	28.5	92	11.2	417	5.63	6.94
1955	10.7	9.29	3.35	52.3	2,576	74.4	323	589	122	53	11	14.5
1956	15.4	16.9	5.97	0.93	54.5	16.1	164	118	0.97	0	1.43	1.97
1957	1.42	1.46	0.74	34.4	99.3	84	205	561	194	668	158	105
1958	84.6	79	166	1,021	1,705	624	301	446	121	29.7	43.7	55.3
1959	53.6	56	21.5	12.5	108	109	169	361	24.4	48.7	50.1	55.1
1960	61.4	63	89.2	121	8.81	243	190	224	75	550	120	83.5
1961	52.9	363	106	391	193	119	310	874	323	90	101	94

Sanchez Gage												
YEAR	Monthly mean stream flow, in ft3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1962	66.1	75.7	45.7	161	71.4	147	369	81.6	22.9	8.32	25.3	36.9
1963	27.3	52.1	25.7	5.57	10.7	61	9.71	320	261	13.1	11.8	10.4
1964	12.4	16.9	14.3	7.85	0.81	1.5	0	37.8	142	5.25	2.05	7.02
1965	10.1	7.95	8.3	2.73	212	4,260	623	751	219	88.7	32.8	55.4
1966	53.3	50.3	25.3	13.7	5.34	47.5	154	684	112	25	18.9	18.2
1967	38.9	24.7	10.6	1.29	0	126	570	457	220	26.9	22.1	22.5
1968	44.2	55.9	29.2	13.1	27.9	25.9	411	442	107	15.5	27.5	25.8
1969	37.9	29.6	26.8	60	175	294	381	236	527	252	165	112
1970	87.6	73.5	36.6	97	150	26.3	76.4	68.5	48.1	28.8	33.6	26.6
1971	40.4	30.5	15.6	5.81	8.23	26	131	295	33.3	24.4	52.1	50
1972	42.9	20.6	7.99	2.79	13.5	22.1	481	233	455	83.3	96.9	68.8
1973	43.8	49.9	94.4	980	1,003	236	138	62.8	119	25.4	19.3	45.9
1974	56	43.5	25.6	6.9	1.38	0	2.49	74.2	18.4	16.1	15.1	11.9
1975	26.4	36	24.2	33.2	33.9	80.7	91.4	19.3	75.4	18.2	13	17.8
1976	27	19.2	5.95	3.75	6.95	7.16	80.1	67	38	14.4	6.76	9.02
1977	14.6	13.9	11	10.8	87.2	16.9	117	347	81.4	3.37	6.1	5.17
1978	11.2	11.8	6.99	1.53	20.7	98.4	56.5	43.7	7.99	1	31.5	12.4
1979	15.4	20.3	11.8	7.21	636	1,054	201	236	62.3	2.34	3.12	9.54
1980	27.8	32.9	4.17	9.61	739	233	8.31	8.39	15.2	3.15	4.67	10.7
1981	12.8	3.85	5.37	2.2	0.87	26.8	109	828	160	36.9	20.7	24.2
1982	27.8	36.1	17	8.28	38.8	176	718	474	192	55.7	64.9	62.7
1983	62.5	80.7	100	391	336	487	107	43.1	23.1	4.52	5.08	25.8
1984	40.4	41.3	15.3	86.8	166	132	53.4	260	129	73.3	76.8	82.8
1985	101	74.2	190	332	936	401	71.7	134	103	117	66.4	55.4
1986	65.8	49.4	21.7	11.4	8.64	459	202	93.1	168	179	233	166
1987	133	358	737	1,406	1,568	396	123	166	98.8	25.2	46	65.3
1988	61.8	74.1	30.4	26.9	23.5	73.3	184	230	257	85.6	46.8	61.4
1989	52	58.8	44.9	16.7	39.2	82.4	54.7	138	133	37.6	36.2	39.6
1990	43.5	67.1	73.6	39.3	60.8	8.5	66.8	310	57.9	89.6	83.5	63.7
1991	76.6	59.5	27.6	22.2	126	73.2	312	791	854	153	162	148
1992	141	174	126	210	107	282	125	252	58.7	17.3	36.9	70.5
1993	79.1	65.4	98.5	332	203	187	126	336	126	38.6	75.1	71.1
1994	81	67.2	74.3	461	1,817	625	60.9	212	250	111	131	103
1995	99.6	89.3	109	115	658	1,552	570	96.5	255	91.2	84.2	75.3

Sanchez Gage												
YEAR	Monthly mean stream flow, in ft3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	75.8	66.5	37.8	25.7	53.5	23.7	220	224	157	37.4	86.1	70.7
1997	67.8	56.9	71.8	148	609	693	69	315	182	90.8	89.3	74.5
1998	81.4	79	196	177	118	13.2	79.3	206	68.3	66.1	168	69.3
1999	76.9	38.5	28.3	334	2,642	355	142	595	108	59.3	82.1	78.6
2000	80.4	61.1	76.4	129	43.6	28.2	65.3	12	0.13	46.9	32.6	33
2001	42.1	134	143	43.9	29.1	7.55	7.74	57.1	15.8	2.61	5.93	9.94
2002	17.4	13	8.52	4.32	0.74	77.6	25.8	2.85	29.1			
Mean	53.6	63.7	62.4	209	416	379	224	309	233	105	60.2	51.2

Ute Creek Gage												
Monthly mean stream flow, in ft3/s												
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1942	39.7	26.3	18.1	459	27.9	30.7	51.1	98.7	201	34.7	17.3	39.9
1943	26.4	10.6	5.42	0	15.3	6.37	78.9	5.48	0.067	0.023	0.13	6.73
1944	28.2	15.1	2.97	1.09	5.15	6.85	94.7	81.6	0.42	0	0.3	6.74
1945	5.68	8.21	1.06	0.1	0	1.77	8.68	109	0.2	0	0	0
1946	0	0	0	0.1	259	21.9	0	174	168	102	6.57	2.74
1947	4.48	0.46	5.42	0.27	170	17	72.7	33.1	0.067	0	0	0.26
1948	0.29	14.5	23.7	0	3.87	153	1.29	62.4	0	0.55	0.033	0
1949	0.032	7.79	1.03	37	145	103	104	115	46.1	0	0	0
1950	0	0	0	0	0	45.8	317	138	67.9	4.52	0	0
1951	0.23	1.11	0.065	0	206	25.3	246	6.23	0	0	0	0.065
1952	0	0	0	0.43	0.68	0.83	1.97	182	0.4	0	0	0
1953	0	0	0	0	0	0	11	101	13.1	0	3.83	0
1954	0	0	0	0	41.1	32.2	12.5	19.6	9.97	139	0	0
1955	0	0	0	6.03	351	1.03	10.1	74.1	83.6	0	0	0
1956	0	0	0	0	31.8	31.5	98.8	36	0	0	0	0
1957	0	0	0	29	14.9	5.73	141	362	37	17.5	0	0
1958	0.23	0.61	21.6	4.3	299	21.8	86.7	141	84.3	0	0.033	0.097
1959	0.87	0.071	0	0	1.65	3.73	46.5	230	4.7	4.03	0.6	8.13
1960	3.94	2.28	0.032	0	0.23	62.8	256	140	2.77	79	1.07	12.3
1961	2.42	3.96	1.87	4.1	0	0.97	82.8	64.1	65.8	1.03	11.8	1.87
1962	4.13	0.57	0	0	29.6	8.83	41	3.39	7.3	0.065	0	0
1963	0.52	0.71	0.065	0	19.4	17.7	1.42	55.4	18.3	0.84	0	0
1964	0	0	0	0	11.6	0.033	4.23	41.2	153	0.32	0.6	0
1965	0	0	0	0	39.4	191	30.3	91.3	41.3	37.6	0	0.74

Ute Creek Gage												
Monthly mean stream flow, in ft3/s												
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1966	0.035	1.82	0.2	0	0	4.99	33.5	15.3	0.053	0	0	0
1967	0	0	0	0.024	30	98.8	156	42.9	13.7	0	0	0
1968	0	0	0	0	0	0	12	42.1	1.26	0.052	0	0
1969	0	0	0	0	65.4	143	45.2	14.8	261	9.52	2.82	3.92
1970	1.67	0.001	0	11	0.004	0.027	11	7.72	1.97	0	0	0
1971	0	0	0	0.001	35.4	8.15	23.2	111	0	2.42	0.31	0
1972	0	0	0	0	2.55	6.98	302	43.2	108	14.3	7.76	9.41
1973	3.46	4.14	1.93	5.52	0.016	0	6.68	3.19	0	0	0	0
1974	0	0	0	0	0	0	0	0.85	0.14	1.4	0.081	0
1975	0	0	0	0	0.016	17.7	28.7	22.2	0.78	0	0	0
1976	0	0	0	0	0.25	0.56	14.7	2.16	20.6	0	0	0
1977	0	0	0	15.9	139	15.6	9.06	118	15.5	0	0	0
1978	0	0	0	0	1.35	26	17.8	0.29	0	0	92.5	0.025
1979	0.014	0.044	0.47	10.8	46.9	43.7	118	172	0.091	0	0	0
1980	0	0	0	0	1.29	0.23	2.01	0.1	0	0.013	0	0
1981	0	0	0	0	12.7	6.07	23.9	520	26.7	0.72	0	0
1982	0	0	0	0.032	11	70.2	224	75.3	26.2	27.2	0.034	0.8
1983	1.32	2.84	6.21	1.41	3.29	11	0	0.027	0	0.33	0	0
1984	0	0	0	0	0	0.14	0.87	55.1	0	0	0	0
1985	0	0	0	0	7.11	5.44	3.87	9.58	2.04	54.2	0.001	0
1986	0	0.3	0	0	1.3	147	4.19	6.61	27.7	23.5	38.9	5.14
1987	4.24	12.6	8.5	6.49	8.74	0.032	0.052	82.4	19.8	0	0	0
1988	2.32	0.81	0.075	0.5	4.56	40.8	25.7	26	45	1.14	0	0
1989	0	0.84	0	0	13.1	24.1	1.29	9.95	14.5	0	0.001	0.081
1990	0.12	0.011	0.69	0.59	0.001	0	10.1	68.5	1.33	4.9	0.71	0
1991	7.38	0.55	0.38	0.11	1.29	8.28	9.59	16.9	64.7	0	0.044	3.34
1992	6.31	2.92	0.008	1.34	2.52	11.5	9.81	51.1	3.83	0	0	0
1993	0	0.001	0.99	1.97	0	97.4	1.28	36	0	0	0	0
1994	0	0	0.004	2.61	43.7	0.47	17.3	4.18	2.57	0.2	0.001	0
1995	0	0	0	0	0.045	7.5	39	0.32	0.3	0	0	0
1996	0	0	0	0	0.45	6.06	16.9	62.5	6.85	0	0	0
1997	0	0	0	7.09	0.37	9.45	4.47	32.7	0.55	0	0	0
1998	2.28	0.42	2.41	0	0.63	0	13	45	0	0.84	0.003	0
1999	0	0	0	0.033	117	5.5	6.67	6.91	2.06	0	0	0
2000	0	0	0	0	0	2.88	0.035	0.94	0	53.6	0.002	0
2001	0	0	0.25	0	0.055	0.03	0	2.32	36.3	0	0	0
2002	0	0	0	0.22	0	31.3	12.2	48.4	52.3			

Ute Creek Gage												
Monthly mean stream flow, in ft3/s												
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	2.4	1.96	1.7	9.95	36.4	26.9	49.2	67.6	28.9	10.3	3.09	1.7

Revuelto Gage												
	Monthly mean stream flow, in ft3/s											
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1959								361	29.9	9.71	1.5	129
1960	19.1	33	4.52	7.23	18.2	492	1,203	342	169	320	8.27	31.5
1961	7.26	7.29	12.3	14.3	35.9	46.1	90.4	88.7	101	35.5	34.1	3.42
1962	2.58	0.86	23.2	42.4	35.9	71.7	190	75.8	86.9	19.2	2.97	3.87
1963	2.23	8.11	6.23	42.8	112	54.6	53	148	49.2	10.2	0.2	1.06
1964	1.32	10.5	0.45	4.8	11.3	1	2.58	8.52	4.87	0	12.3	0.23
1965	0	0	1.48	0.77	102	49.1	114	46	43.5	22.8	0.12	1.14
1966	0.14	1.78	0.61	12.3	28.6	66.3	94.8	182	16.8	6.7	0.21	6.27
1967	0.26	0.29	1.08	8.2	19.4	21.6	240	113	42.7	5.43	1.03	4.96
1968	10.2	3.78	3.1	12	31.6	18.6	27.4	38.5	13	16.1	1.46	4.77
1969	1.38	3.4	1.81	13.2	177	59.1	43.2	70.3	515	44.1	9.09	4.96
1970	3.67	2.39	5.81	346	20.5	16.5	63.9	82.7	101	17.7	3.53	2.64
1971	3.53	4.04	2.24	16.7	60.7	46.3	99.8	105	40.6	20.9	26	8.06
1972	3.01	2.01	0.16	3.54	7.86	0.91	475	388	191	23.7	8.97	6.33
1973	4.8	5.08	9.46	12	19.4	16.6	78.8	32.8	24.1	17.6	0.87	3.94
1974	4.95	8.29	2.73	21.3	18.1	8.46	15.4	37.7	83.6	171	10.1	5.03
1975	5.67	12.9	3.19	5.14	4.95	44.3	102	57.7	5.03	0.2	1.35	0.001
1976	0.031	0.099	0.23	0.39	0.085	38.5	87.5	2.28	62	2.75	0.076	0.34
1977	0.29	0.17	0.051	40.5	11.3	4.09	44.7	234	4.25	0.036	0.056	0.039
1978	0.085	0.57	0.064	0.86	47	142	87.5	0.93	1.72	0.37	16.6	0.025
1979	0.51	0.44	0.031	0.87	15.6	3.75	95.6	92.2	24.4	10.1	6.09	0.026
1980	0.44	3.25	0.003	11.7	58.3	13.4	1.09	67.6	22.6	11.7	7.97	1.44
1981	2.16	1.06	1.56	0.32	75.5	143	51.6	575	125	18.4	1.77	1.53
1982	0.97	0.51	0.21	4.1	35	94.8	185	63.5	24.4	73.8	4.77	4.19
1983	4.32	42.5	11.8	7.64	14.9	72.6	0.42	17.9	9.06	47.2	7.25	13.7
1984	16.8	1.41	11.5	30.6	34.7	47	45.5	178	16.7	83.2	26.2	8.67
1985	4.79	7.73	52.1	19.3	102	49.8	6.15	14.4	70.5	84.3	11.5	2.36

Revuelto Gage												
	Monthly mean stream flow, in ft3/s											
YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	2.02	31.2	1.47	5.15	58.2	120	1.13	25.9	35.8	39.1	21.8	22.1
1987	19.9	23.8	19.9	16.2	99.4	34.9	6.07	138	46.7	14.4	7.91	4.07
1988	5.83	1.58	3.02	53.6	48.6	351	128	112	267	19.7	13.6	4.67
1989	3.56	4.66	5.97	22.3	19.9	68.9	80	203	49.7	6.57	2.17	3.95
1990	27.9	28.2	2.41	2.44	13.2	0.89	21.5	67.1	148	14.6	18.3	1.41
1991	8.91	1.62	18.6	5.27	203	39.2	224	237	88.8	12.2	34.1	56.6
1992	18.3	6.87	3.86	15	54	76.3	67.3	97.2	22.3	14.6	14	7.73
1993	9.47	8.25	2.15	8.58	13.5	120	67.8	83	45.7	30.5	4.82	4.54
1994	3.61	2.71	15.6	18.9	44.4	36.8	80.8	54.6	27.5	40.8	6.04	1.8
1995	2.33	1.55	1.97	43.4	36.8	30.5	47.4	129	143	19.4	12.6	7.94
1996	3.97	2	7.38	12.8	14.7	307	278	116	47.8	21.9	4.69	20.5
1997	4.61	8.18	7.49	157	40.7	278	135	176	63.6	45.5	5.42	11.9
1998	10.3	1.7	45.5	51.3	13.1	2.08	50.4	239	14.9	136	41.2	4.69
1999	3.66	8.49	17.9	55.1	148	30.8	33.1	54	35.6	7.15	3	6.46
2000	3.15	1.64	11.3	52.3	37.8	56.9	42.2	10.1	12.2	161	19.1	4.3
2001	9.18	9.94	79.3	0.84	77.1	141	96.4	55	23.9	17.9	10.9	1.07
2002	2.55	2.49	3.97	1.8	0.97	53.7	69	13.8	68.8			
Mean	5.58	7.12	9.39	27.9	47	78.4	115	119	68.6	38.9	9.86	9.61

Appendix K

Water Use Information

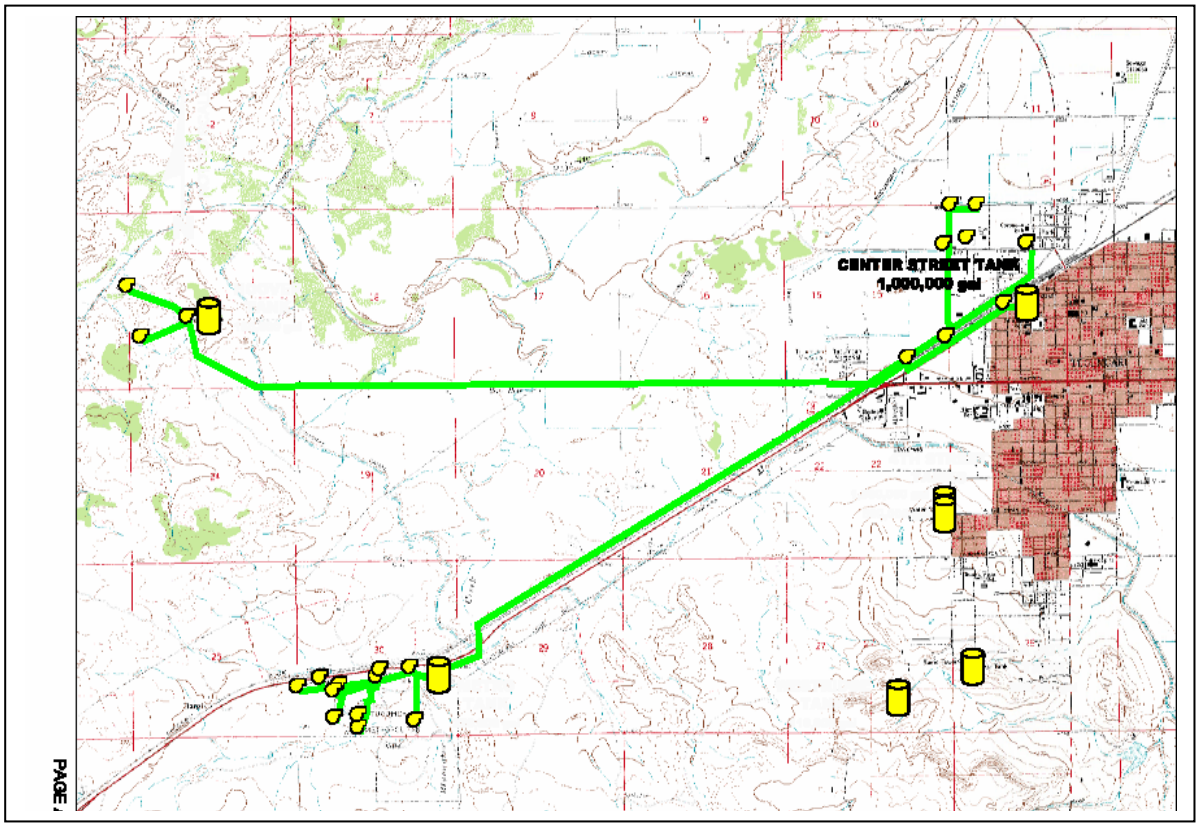
Table of Equivalents	
Acre-Foot	43560 Cubic Feet (ft^3)
Acre-Foot	325851.43 Gallons
Cubic Feet/Second (cfs)	448.83 Gallons/Minute (gpm)
Cubic Foot	7.48 Gallons
Mile per Hour (mph)	1.467 Feet per Second (fps)

Municipal Water Usage 1984-2003

Water Production (Acre-Feet)					
	2003	2002	2001	2000	1999
Tucumcari	1,465.21	1,646.54	1,603.50	1,725.40	1,552.83
Logan	333.60	305.64	262.03	377.13	247.66
San Jon	64.51	60.70	58.75	66.62	55.61
House	37.94	24.20	21.09	13.86	12.96
Nara Visa	8.15	8.15	8.15	8.15	8.15
Forrest	3.14	3.14	3.14	3.14	3.14
Total	1,912.54	2,048.38	1,956.66	2,194.29	1,880.35
	1998	1997	1996	1995	1994
Tucumcari	1,665.89	1,543.13	1,654.31	1,726.14	1,698.66
Logan	276.37	264.32	305.87	266.29	268.12
San Jon	64.19	63.77	48.97	58.20	46.18
House	10.47	10.38	11.15	13.79	12.89
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	2,016.93	1,881.61	2,020.30	2,064.41	2,025.85
	1993	1992	1991	1990	1989
Tucumcari	1,840.42	1,575.29	1,619.20	1,619.93	1,696.77
Logan	231.33	225.25	214.10	256.57	147.09
San Jon	0.00	0.00	12.49	11.04	8.67
House	9.07	11.45	12.49	11.04	8.67
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	2,080.82	1,811.98	1,858.28	1,898.59	1,861.20

Water Production (Acre-Feet)					
	1988	1987	1986	1985	1984
Tucumcari	1,565.79	1,584.17	1,714.28	1,865.30	1,787.15
Logan	234.56	212.80	209.90	201.90	0.00
San Jon	1.22	0.00	0.00	0.00	0.00
House	1.22	0.00	0.00	0.00	0.00
Nara Visa	0.00	0.00	0.00	0.00	0.00
Forrest	0.00	0.00	0.00	0.00	0.00
Total	1,802.80	1,796.97	1,924.18	2,067.20	1,787.15

City of Tucumcari Water System



Smith Engineering, 2003

Village of Logan Water System

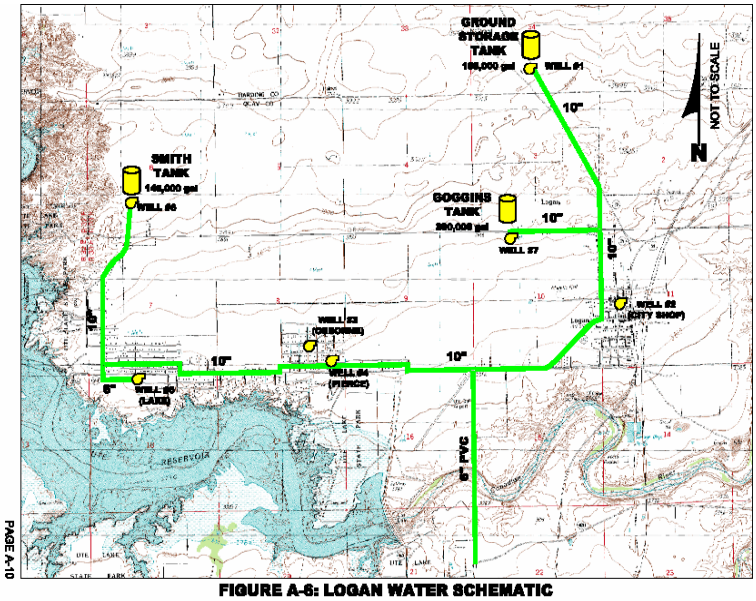
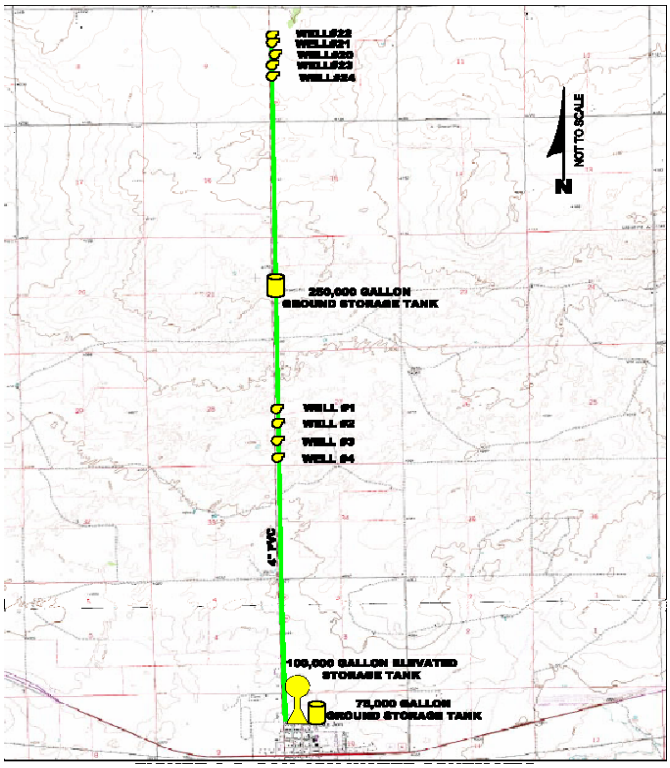


FIGURE A-6: LOGAN WATER SCHEMATIC

Smith Engineering, 2003

Village of San Jon Water System



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Irrigable Acreage in Quay County

YEAR	Acreage Irrigated with Surface Water Only	Acreage Irrigated with Ground Water Only	Acreage Irrigated with combined water	Total Acreage Irrigated	Total Irrigable Acreage Idle or Fallow	Total Irrigable Acreage
1975						
1980	32870	11160	0	44030	11460	55490
1985						
1990	29529	6950	0	36479	19011	55490
1993	32018	3830	0	35848	19642	55490
1994	31513	6050	0	37563	17927	55490
1995	33459	9436	0	42895	12595	55490
2000	32657	3560	0	36217	19273	55490

Irrigated Agriculture Consumptive Use and Withdrawal Estimates as Reported in OSE Water Use Reports 1975-2000

Irrigated Agriculture Withdrawals in Acre-Feet																		
YEAR	Locale	T	CIRSW	CIRGW	ASWO	AGWO	ASWC	AGWC	TAI	EF	EC	EJ	MSW	MGW	TFWSW	CLSW	TPWSW	TPWGW
1975	AHCD	F							0									
	AHCD	S							0									
	OAHCD	S							0									
	VOH	S							0									
1980	AHCD	F			32870	0	0	0	32870								72750	0
	AHCD	S			0	0	0	0	0								0	11680
	OAHCD	S			0	5190	0	0	5190								0	0
	VOH	S			0	5560	0	0	5560								0	12510
1985	AHCD	F			28295	0			28295								62139	0
	AHCD	S			3900	0			3900								6671	0
	OAHCD	S			0	3105			3105								0	7868
	VOH	F			0	900			900								0	2331
	VOH	S			0	1720			1720								0	4170
1990	AHCD	F	0.85	0	25081	0	0	0	25081	0.6	0.533	0.3198	Y	-	35531	31131	66662	0
	AHCD	S	0.85	0	4448	0	0	0	4448	0.6	0.533	0.3198	Y	-	6301	5521	11822	0
	OAHCD	F	0	2.11	0	1450	0	0	1450	0.6	0	0	-	N	0	0	0	5099
	OAHCD	S	0	1.89	0	1680	0	0	1680	0.65	0	0	-	N	0	0	0	4885
	VOH	S		1.6	0	1770	0	0	1770	0.65	0	0	-	N	0	0	0	4357
	VOH	F	0	1.38	0	400	0	0	400	0.65	0	0	-	N	0	0	0	920
	VOH	S	0	1.31	0	1650	0	0	1650	0.65	0	0	-	N	0	0	0	3325
1993	AHCD	F	0.949	0	28538	0	0	0	28538	0.6	0.531	0.3187	Y	-	45138	39836	84974	0
	AHCD	S	0.842	0	3480	0	0	0	3480	0.65	0.531	0.3453	Y	-	4508	3978	8486	0
	OAHCD	S	0	1.526	0	1650	0	0	1650	0.65	0	0	-	N	0	0	0	3874
	VOH	S	0	1.528	0	2180	0	0	2180	0.65	0	0	-	N	0	0	0	5125
1994	AHCD	F	0.985	0	26953	0	0	0	26953	0.6	0.521	0.3218	Y	-	44284	40632	84916	0
	AHCD	S	0.772	0	4560	0	0	0	4560	0.65	0.521	0.3368	Y	-	5416	4973	10389	0
	OAHCD	S	0	1.303	0	1650	0	0	1650	0.65	0	0	-	N	0	0	0	3308
	VOH	S	0	0.983	0	4400	0	0	4400	0.65	0	0	-	N	0	0	0	6654
1995	AHCD	F	1.02	0	30907	0	0	0	30907	0.6	0.516	0.3093	Y	-	52452	49382	101834	0
	AHCD	S	0.649	0	2552	0	0	0	2552	0.65	0.516	0.3351	Y	-	2548	2395	4943	5603
	IAHCD	F	0	1.268	0	5446	0	0	5446	0.55	0	0	Y	-	6521	5991	12512	12556
	OAHCD	S	0	2.477	0	600	0	0	600	0.65	0	0	-	N	0	0	0	2286
	VOH	S	0	1.453	0	3390	0	0	3390	0.65	0	0	-	N	0	0	0	7578
2000	AHCD	F	0.861	0	27096	0	0	0	27096	0.6	0.427	0.2564	Y	-	38883	52092	90975	0
	AHCD	S	0.848	0	5561	0	0	0	5561	0.65	0.427	0.2564	Y	-	7257	9722	16979	0
	IAHCD	D	0	1.75	0	17	0	0	17	0.85	0	0	-	N	0	0	0	35
	OAHCD	S	0	1.247	0	883	0	0	883	0.65	0	0	-	N	0	0	0	1694
	VOH	F	0	1.029	0	310	0	0	310	0.55	0	0	-	N	0	0	0	580
	VOH	S	0	1.172	0	2350	0	0	2350	0.65	0	0	-	N	0	0	0	4237

Arch Hurley Conservancy District(AHCD):Vicinity of House(VOH):Outside Arch Hurley Conservancy District(OAHCD):Inside Arch Hurley Conservancy District but Exclusive of AHCD(IAHCD)Type of Irrigation; Drip(D), Flood(F),Sprinkler(S),:Consumptive Irrigation Requirement for acreage Irrigated with Surface Water(CIRSW):Consumptive Irrigation Requirement for acreage Irrigated with Ground Water(CIRGW):Acreage Irrigated with Surface Water Only(ASWO):Acreage Irrigated with Ground Water Only(AGWO):Surface Water component of acreage Irrigated with combined water(ASWC):Ground Water component of acreage Irrigated with combined water(AGWC):Total Acreage Irrigated(TAI):On-farm Irrigation Efficiency(EF):Off-farm Irrigation Efficiency(EC):Project Efficiency(EJ):Surface Water Withdrawals are Measured(MSW):Ground Water Withdrawals are Measured(MGW):Total Farm Withdrawal-Surface Water(TFWSW):Surface Water Conveyance Losses from Reservoir or Stream to Head gate(CLSW):Total Project Withdrawals - Surface Water(TPWSW):Total Project Withdrawals - Ground Water(TPWGW)

40-Year Water Usage Projection Based on Population Growth

Projected Water Use: Quay County								
2000 to 2040								
Census Estimates								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	20	19	19	19	18	18	17
Logan (261gpcd)	320	319	316	311	304	294	283	272
San Jon (187gpcd)	64	64	63	62	61	59	57	54
Tucumcari (245gpcd)	1664	1657	1643	1620	1582	1531	1472	1414
Balance of Quay County (84gpcd)	253	252	250	247	241	233	224	215
TOTAL	2321	2312	2292	2260	2207	2135	2054	1972
Low Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	20	20	20	21	21	21	21
Logan (261gpcd)	320	323	326	329	333	336	339	343
San Jon (187gpcd)	64	65	65	66	67	67	68	69
Tucumcari (245gpcd)	1664	1680	1697	1714	1731	1748	1766	1784
Balance of Quay County (84gpcd)	253	256	259	261	264	266	269	272
TOTAL	2321	2344	2367	2391	2415	2439	2463	2488
Medium Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	21	22	23	24	25	26	28
Logan (261gpcd)	320	336	353	370	389	408	429	450
San Jon (187gpcd)	64	67	71	74	78	82	86	90
Tucumcari (245gpcd)	1664	1747	1834	1926	2022	2123	2230	2341
Balance of Quay County (84gpcd)	253	266	279	293	308	323	340	357
TOTAL	2321	2437	2559	2686	2821	2962	3110	3266
Fast Growth								
County	2000	2005	2010	2015	2020	2025	2030	2040
House (245 gpcd)	20	22	24	26	29	32	35	38
Logan (261gpcd)	320	352	387	426	468	515	567	623
San Jon (187gpcd)	64	71	78	85	94	103	114	125
Tucumcari (245gpcd)	1664	1830	2013	2214	2436	2679	2947	3242
Balance of Quay County (84gpcd)	253	279	307	337	371	408	449	494
TOTAL	2321	2553	2808	3089	3398	3738	4112	4523

Appendix L

Temperature Summaries by Station

	Monthly Averages			Daily Extremes				Monthly Extremes	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Lowest Mean
	˚F	˚F	˚F	˚F	m/dd/yyyy	˚F	m/dd/yyyy	˚F	˚F
NEWKIRK	73.2	42	57.6	108	6/23/1990	-19	1/23/1990	59.6	56.1
MC CARTY RANCH	69.6	41.3	55.4	107	6/25/1990	-13	1/23/1990	57.4	54
RINESTINE RANCH	72.1	41.1	56.7	106	6/24/1978	-11	2/8/1980	56.8	55.5
OBAR	73.4	41	57.2	109	16/22/1953	-20	2/1/1951	60.1	55.1
UTE DAM	73.2	43.1	58.2	107	6/28/1968	-11	1/5/1971	58.6	57.6
LOGAN	75.1	42.1	58.6	110	8/4/1944	-20	2/1/1951	60	56.9
TUCUMCARI 4 NE	73.2	43.5	58.4	109	6/25/1990	-22	1/13/1963	61.3	55.5
TUCUMCARI FAA AIRPORT	72.7	43.6	58.2	109	6/28/1968	-19	1/13/1963	60	56.8
SAN JON	73.5	43.5	58.5	110	6/24/1990	-33	1/13/1963	61.3	55.9
CAMERON	70.5	40.7	55.6	106	6/29/1957	-21	2/1/1951	58.8	54
RAGLAND 3 SSW	70.3	40.7	55.5	106	6/21/1981	-15	1/13/1963	56.9	53.1

Temperature (Average Monthly)

NEWKIRK													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1966	-----	36.75	49.9	57.53	67.39	73.2	82.78	69.57	69.78	57.21	49.42	35	55.13
1967	-----	-----	-----	-----	65.2	73.42	78.26	73.26	68.68	60.97	49.02	33.79	62.48
1968	38.44	41.71	48.25	52.89	64.32	76.43	76.27	75.02	68.52	60.82	45.52	40.2	57.37
1969	45.5	42.96	40.34	57.08	65.47	70.58	80.21	77.6	69.38	55.35	45.22	39.31	57.42
1970	34.44	43.93	42.95	52.85	66.05	70.27	77.05	76.47	66.67	53.02	46.75	42.95	56.12
1971	38.24	41.29	48.71	55.53	62.9	74.62	76.4	71.56	66.3	56	48.32	37.52	56.45
1972	39.52	43.05	52.32	58.42	65.08	75.58	76.06	74.21	68.72	58.13	39.33	37.98	57.37
1973	34.85	39.82	46.66	49.3	62.56	73.77	76.66	76.98	67.97	60.97	51.57	39.77	56.74
1974	39.16	42	53.87	57.35	71.79	76.7	79.34	74.92	65.45	59.24	46.5	37.31	58.64
1975	38.24	39.45	48.16	54.43	62.66	73.8	75.1	77.26	66.95	60.06	46.5	41.58	57.02
1976	38.61	48.34	49	58.58	63.47	74.38	75.82	76.1	68.88	53.6	42.27	37.55	57.22
1977	33.53	42.25	45.4	57.18	67.37	78.22	79.98	78.65	72.75	60.4	49.05	44.34	59.09
1978	33.95	37.7	49.27	59.98	65.13	75.8	80.1	76.43	69.27	60.13	47.22	33.97	57.41
1979	30.55	40.93	47.44	55.63	64.66	71.55	78.92	74.8	70.1	62.1	40.68	39.52	56.41
1980	38.7	40.64	46.85	52.98	62.37	80.32	83.81	77.82	71.28	57.05	45.36	46.28	58.62
1981	38.81	44.46	47.47	62.87	65.06	77.78	79.69	75.16	69.83	58.97	51.43	43.48	59.59
1982	40.15	40	49.9	57.5	65.42	73.83	78.89	77.18	71.08	57.47	45.83	36.61	57.82
1983	37.95	41.14	47.71	51.88	61.55	72.38	80.23	79.4	74.17	60.32	50.13	32.42	57.44
1984	36.15	43.19	47.31	53.67	68.85	74.58	77.95	74.97	68.37	54.73	45.93	39.1	57.07
1985	33.39	39.61	50.32	59.02	66.03	74.88	77.44	77.35	68.6	58.76	48.42	37.35	57.6
1986	44.1	41.64	53.08	59.42	64.44	72.48	78.58	76.6	69.13	56.44	44.58	37.24	58.14
1987	35.52	41.7	46.06	55.55	64.03	72.67	78.24	75.47	68.73	60.85	46.22	36.44	56.79
1988	34.47	42.79	48.23	56.28	64.19	74.28	76.69	75.71	67.63	61.35	49.07	36.34	57.25
1989	40.97	36.52	53.97	59.77	68.73	71.32	77.06	75.44	63.75	60.38	48.5	34.21	56.65
1990	39.66	38.67	44.81	57.18	63.31	80.43	75.27	72.29	69.3	57.53	49.92	34.08	60.2
1991	34.34	42.7	47.23	56.53	66.07	73.32	74.11	73.47	-----	58.35	41.72	37.24	55.01
1992	35.02	42.9	49.17	59.38	62.27	70.47	76.79	74.6	69.78	61	41.7	37.15	57.17
1993	38.47	39.5	48.11	56.38	64.45	74.52	-----	-----	-----	57.37	43.18	38.53	51.17
1994	37.23	42.36	48.91	56.88	66.23	80.07	78.31	78.92	70.08	57.4	47.08	42.16	57.66
1995	38.71	46.73	48.56	53.12	63.18	72.79	78.91	80.08	68.98	59.52	50.33	40.18	56.62
1996	39.92	43.6	46.5	58	73.21	76.02	77.79	75.16	66.97	57.53	46.83	42	58.63
1997	33.03	39.21	50.66	49.72	64.19	72.13	77.16	74.63	69.06	57.87	42.8	32.26	53.97
1998	40.47	40.93	44.89	52.18	67.42	75.25	80.21	74.74	73.4	59.69	49.55	39.16	58.16
1999	42.52	47.18	48.68	54	-----	-----	-----	79.67	68.27	56.73	50.47	38.56	46.9
2000	42.17	49.21	48.75	60.34	70.44	75.05	79.06	78.52	73.25	56.25	39.95	34.13	58.93
2001	33.6	42.61	46.53	59.37	65.42	76.22	81.36	76.08	69.39	59.78	50.35	39.4	58.34
2002	39.85	40.04	46.06	62.13	67.39	79.4	77.85	79.18	69.87	56.26	45.48	43.62	60.32
2003	42.48	41.88	50.07	57.86	69.14	72.19	81.52	78.22	69.17	62.22	47.97	40.87	58.93
2004	41.82	36	52.81	54.66	70.28	75.75	-----	-----	-----	-----	-----	-----	
Period of Record Statistics													
MEAN	37.83	41.96	48.29	56.35	65.52	74.46	78.08	76.12	69.35	58.43	46.58	38.27	57.66

NEWKIRK													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
S.D.	3.4	2.83	2.89	3.24	2.68	2.59	2	2.03	1.99	2.36	3.28	3.33	0.9
SKEW	0.04	0.57	-0.14	-0.22	1.06	0.56	0.51	-0.07	0.57	-0.39	-0.55	0.24	0.4
MAX	45.5	49.21	53.97	62.87	73.21	80.43	83.81	80.08	74.17	62.22	51.57	46.28	59.59
MIN	30.55	36.52	40.34	49.3	61.55	70.27	74.11	71.56	65.45	53.02	39.33	32.26	56.12
NO YRS	36	36	34	34	35	36	33	35	33	35	38	37	

MCCARTY RANCH													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1983	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	47.39	26.34	36.87
1984	33.06	40.26	43.79	50.32	63.53	71.32	75.44	73.16	66.07	51.42	45.21	37.11	54.22
1985	32.27	35.54	46.4	56.88	63.14	71.12	76.47	76.03	65.72	54.76	44.12	34.4	54.74
1986	42.1	40.59	50.82	57.32	62.47	70.83	76.68	75.03	67.43	54.52	42.32	35.84	56.33
1987	33.77	40.64	43.94	53.9	63.21	70.75	75.19	73.08	65.22	56.73	45.13	34.24	54.65
1988	30.89	38.47	44.45	52.52	62.26	71.95	74.29	74.76	64.88	57.82	46.97	36.42	54.64
1989	38.02	32.5	50.34	57.6	65.87	67.35	74.34	72.85	63.97	57.26	46.73	30.52	54.78
1990	35.92	37.73	44.74	54.18	61.31	78.45	74.77	72.85	68.72	55.08	47.32	31.39	55.21
1991	32.11	43.8	45.98	54.77	64.45	71.9	72.85	72.65	63.88	59.77	41.8	36.61	55.05
1992	36.34	42.98	48.66	57.27	61.74	68.28	74.65	71.5	67.55	58.06	39.28	35.88	56.94
1993	32.85	36.79	46.58	53.8	62.73	70.98	76.23	74.34	66.2	53.79	40.23	37.32	54.32
1994	36.05	37.48	46.48	54.55	63	76.45	76.13	76.21	68.95	55.98	44.88	41.03	56.43
1995	36.98	44.16	45.69	50.78	60.66	69.77	75.92	77.06	66.92	56.9	47.7	38.31	55.9
1996	35.13	42.14	42.47	55.05	69.4	74.02	75.39	73.63	64.18	54.85	44.98	36.27	55.63
1997	32.34	36.54	48.34	46.83	61.65	70.13	76.47	74.39	69.52	56.58	41.8	33.61	54.02
1998	38.92	40.09	43.08	51.12	66.63	73.9	79.03	73.13	72.93	58.03	47.65	37.44	56.83
1999	39.34	44.71	43.47	55.8	60.73	70.48	76.95	76.18	66.25	57.92	51.1	37.66	58.16
2000	39.73	46.02	48.53	56.8	68.61	72.67	78.48	78.97	71.55	56.45	38.25	33.1	57.43
2001	32	39.82	43.07	58.64	63.05	73.1	79.4	75.29	69.34	57.24	48.58	37.6	56.43
2002	37.02	37.55	42.61	58.05	64.9	77.68	78.9	75.36	67.53	52.69	43.28	36.19	46.54
2003	40.34	37.61	47.42	55.22	66.47	69.92	79.79	76.78	69.12	58.06	49.5	39.73	47.96
2004	38.3	36.65	52.08	56.54	68.94	74.79	-----	-----	-----	-----	-----	-----	
Period of Record Statistics													
MEAN	35.76	39.77	45.97	54.47	63.79	71.86	76.04	74.51	67.18	56	44.74	35.34	55.41
S.D.	3.27	3.46	2.56	3.19	2.49	2.68	1.7	1.88	2.57	2.08	3.35	3.31	1.03
SKEW	0.24	0	0.33	-0.73	0.84	0.77	0.4	0.61	0.66	-0.46	-0.25	-1.03	0.4
MAX	42.1	46.02	50.82	58.64	69.4	78.45	79.4	78.97	72.93	59.77	51.1	41.03	57.43
MIN	30.89	32.5	42.47	46.83	60.66	67.35	72.85	71.5	63.88	51.42	38.25	26.34	54.02
NO YRS	20	20	19	18	20	18	18	18	18	18	20	19	

TUCUMCARI 4 NE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1904	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	41.09	-----
1905	36.58	31.23	52.63	54.46	65.56	77.15	75.67	78.41	72.17	57.41	47.21	34.4	60.13
1906	39.34	40.33	44.1	56.91	65.75	75.78	75.06	75.16	70.33	56.87	41.45	45.39	58.4
1907	44.68	49.25	57.87	55.47	61.73	72.03	78.77	78.94	72.78	-----	43.06	41.78	60.06
1908	43.85	44.22	56.42	56.98	64.23	77.65	76.9	77.35	71.12	58.71	46.1	42.56	59.68
1909	45.52	45.29	47.94	57.33	63.77	76.83	80.95	79.32	71.08	60.34	52.88	33.23	59.54
1910	42.95	40.23	57.45	60.8	66.4	78.87	82.21	77.13	73.28	60.74	51.63	41.42	61.09
1911	47.03	40.96	52.77	59.05	68.26	78.2	77.6	79.19	75.07	57.42	45.02	32.52	59.42
1912	38.16	36.97	44.55	55.15	66.16	71.4	79.71	77.15	66.67	60.61	47.72	36.98	56.77
1913	36.53	37.7	47.02	57.55	69.44	72.82	80.35	81.03	67.98	57.63	52.75	-----	60.07
1914	46.55	42.45	51.13	56.95	63.73	75.95	76.56	77.71	74.58	59.69	51.48	37.69	60.72
1915	38.12	41.46	40.58	57.55	62.84	73.95	76.56	72.69	69.83	59.56	49.8	40.56	58.67
1916	38.23	45.5	54.03	54.68	66.77	77.28	80.23	75.87	69.35	57.5	43.8	35.82	58.26
1917	36.74	41.34	46.69	55.4	59.81	75.17	81.63	74.81	69.77	57.79	50.88	40.15	57.51
1918	30.65	46	53.93	52.47	68.24	78.47	79.9	78.13	66.87	60.21	42.26	31.93	57.42
1919	28.56	38.77	47.11	55.6	63.44	69.67	75.48	76.74	71.13	56.68	44.42	38.26	55.49
1920	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	43.58	43.58
1921	42.35	-----	52.03	55.47	65	71.47	77.34	77.1	73.65	62.94	51.81	38.85	61.62
1922	30.32	36.25	45.47	56.05	65.44	76.05	80.73	81.5	73.6	60.63	44.83	42.07	57.74
1923	44.45	36.84	44.11	55.67	66.6	74.9	79.77	76.82	69.2	53.92	44.88	32.61	56.65
1924	34.98	40.21	40.28	55.93	62.52	77.83	76.65	78.24	68.28	60.45	50.05	29.58	56.25
1925	35.24	46.04	53.15	60.53	67.44	78.37	79.68	74.84	69.2	52.6	46.15	35.48	58.23
1926	34.67	46.14	43.31	53.07	63.42	73.07	75.94	76.9	71.35	60.37	48.07	36.45	56.9
1927	40.9	44.46	48.29	61.18	71.52	73.23	78.82	74.55	69.26	60.48	52	33.55	59.02
1928	39.87	39.05	50.69	54.48	64.98	74.42	80.1	75.44	69.75	59.89	44.22	36.81	57.47
1929	36.62	30.82	48.03	57.58	62.52	75.05	78.32	77.77	69.42	57.76	37.5	40.15	55.96
1930	27.45	47.95	44.65	63.31	64.03	75.68	78.31	78.37	71.35	56.79	45.93	34.26	57.34
1931	35.69	42.93	42.81	54.6	61.39	76.17	77.97	74	74.87	60.69	45.07	39.02	57.1
1932	33.76	47.38	44.21	57.55	66.02	72.5	80.08	77.73	67.83	57.05	47.13	30.4	56.8
1933	40.9	35.93	49.98	54.52	66.45	77.78	80.5	75.79	74.32	61.76	49.15	45.4	59.37
1934	40.52	44.02	49.87	60.72	71.6	79.1	83.69	80.84	70.1	63.52	49.15	41.47	61.22
1935	42.95	43.59	52.6	58.38	61.08	75.47	-----	78.02	68.72	60.32	46.02	38.23	56.85
1936	35.82	39.53	51.31	58.66	67.63	77.6	78.89	79.92	68.72	56.53	44.13	41.1	58.32
1937	-----	40.48	44.34	-----	-----	64	-----	-----	-----	-----	-----	-----	42.41
1938	38.29	41.23	51.45	57.43	65.85	74.38	78.79	80.9	71.32	61.58	44.75	40	58.83
1939	39.76	32.82	50.95	57.65	66.22	77.21	78.31	76.52	73	59.74	44.28	40.6	58.09
1940	30.68	41.22	49.85	56.37	66.6	74.98	81.97	75.4	73.75	62.85	42.55	39.95	58.02
1941	38.48	43.25	44.23	54.73	65.15	70.47	74.65	74.94	68.62	57.89	48.9	39.94	56.77
1942	37.37	36.84	46.21	56.37	63.98	74.32	77.85	75.55	66.48	56.78	49.8	40.71	56.86
1943	37.65	44.54	46.15	61.67	70	76.1	78.9	82.42	70.37	58.65	44.65	30.89	57.45
1944	35.26	41.23	45.77	53.73	64.71	74.02	78.02	77.84	68.77	59.16	45.95	33.98	56.54
1945	36.98	43.02	50.15	52.02	67.13	74.02	78.32	77.55	70.17	58.73	49.37	37.35	57.9
1946	37.19	42.34	51.63	64.37	63.66	78.63	80.56	78.85	72.03	59.35	44.17	43.94	59.73

TUCUMCARI 4 NE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1947	35.77	38.21	44.06	54.95	65.37	75.45	80.93	78.97	75.07	63.94	41.22	37.32	57.61
1948	32.5	35.59	41.9	61.22	66.61	74.29	79.98	77.29	72.68	59.26	42.84	41.53	57.14
1949	27.89	39.5	48.29	54.12	65.39	72.23	77.66	76.29	70.27	58.24	53.07	38.1	56.75
1950	42.03	45.43	47.85	58.02	66.63	76.85	74.81	74.16	67.42	65.74	48.38	40.39	58.98
1951	36.34	41.98	45.61	54.98	65.15	73.6	82.02	79.76	71.63	60.44	43.5	39	57.83
1952	-----	43.53	45.55	56.55	66.39	80.5	78.95	79.92	70.68	58.87	40.92	37.23	59.92
1953	45.16	39.68	52.5	55.22	63.11	81.68	80.35	77.23	72.32	60.53	48.08	35.48	59.28
1954	40.48	47.96	46.5	62.22	63.95	77.95	82.23	78.66	74.67	60.1	50.35	42.69	60.65
1955	37.68	38.46	47.58	57.2	64.53	72.35	76.31	76.97	70.48	59.79	47.3	43.13	57.65
1956	41.26	37.71	49.85	55.42	70.63	78	77.85	76.06	72.77	63.18	45.1	41.63	59.12
1957	38.42	48.59	47.73	54.2	63.37	75.33	80.98	76.65	68.18	58.71	43.28	45.71	58.43
1958	38.6	43.5	41.69	54.7	68.26	77.23	78.79	78.39	71.1	58.39	49.62	42	58.52
1959	35.94	42.34	49.23	57.07	67.05	75.72	77.05	76.92	70.68	56.92	46.32	40.98	58.02
1960	35.19	37.33	48.34	60.07	65.94	75.77	74.97	76.48	70.34	59.56	50.02	35.68	57.47
1961	37.63	43.09	48.95	56.45	67.19	75.37	76.61	75.55	67.67	60.77	43.88	38.15	57.61
1962	35	48.86	46.5	59.23	70.24	72.77	76.34	78.23	70.73	61.6	48.83	41.5	59.15
1963	31.98	42.89	49.66	60.48	67.16	73.47	79.29	76.11	71.67	64.23	49.6	36.1	58.55
1964	39.97	34.43	46.79	57.72	68.11	75.8	80.45	77.16	69	60.31	46.38	41.4	58.13
1965	43.63	40.38	41.45	59.85	64.85	71.87	77.94	73.48	62.89	60.65	54.28	44.26	57.51
1966	33.76	38.52	52.66	59.25	68.13	74.47	82.1	73.11	69.7	58.61	52.18	37.24	58.31
1967	42.37	43.2	55.29	62.43	65.52	73.85	76.63	73.61	70.27	63.45	49.88	36.95	59.45
1968	42.06	42.69	49.15	56.08	66.19	77.7	78.15	77.11	70.6	-----	47.6	41.16	58.95
1969	46.44	43.66	42.94	60.77	68.05	73.55	81.4	79.76	70.97	56.98	48.38	42.76	59.64
1970	38.56	46.89	46.27	56.67	68.9	73.98	79.53	78.34	69.98	55.82	50.55	45.52	59.25
1971	41.24	43	51.42	58.23	65.87	77.03	78.21	73.24	69.47	59.39	50.37	41.48	59.08
1972	42.23	47.34	56.47	62.75	67.48	76.43	77.13	74.89	70.62	59.89	41.05	39.4	59.64
1973	36.31	42.11	49.31	52.3	64.24	74.38	77.31	77.81	68.67	63	53.53	41.32	58.36
1974	40.4	45.61	56.73	59.62	72.68	77.12	79.84	75.45	65.8	60.95	48.45	39.32	60.16
1975	40.58	39.68	49.77	56.2	65.69	74.95	75.63	78.08	68.35	62.23	49	43.47	58.64
1976	41.13	50.67	50.68	61.07	64.84	76.37	77.32	78.27	70.32	55.81	44.17	41.47	59.34
1977	34.61	45.41	49.32	59.35	69.6	80.02	81.71	79.85	75.12	63.02	51.2	45.92	61.26
1978	36.1	38.73	51.89	62.73	67.06	77.28	81.76	77.53	70.58	62.15	48.88	35.82	59.21
1979	30.35	43.11	50.23	57.6	65.65	73.12	79.03	75.1	70.95	63.37	42.13	41.92	57.71
1980	39.4	42.66	48.29	55.2	64.4	80.7	83.35	77.56	70.6	58.32	47.02	48.26	59.65
1981	42.21	46.8	49.89	63.28	65.18	77.48	79.16	73.9	68.78	58.13	51.9	42	59.89
1982	39.29	39	49.68	56.78	65.44	72.13	78.11	76.9	70.95	57.58	45.23	36.89	57.33
1983	37.77	39.29	47.68	51.27	61.87	70.4	79.39	79.05	73.3	59.68	50.3	29.94	56.66
1984	35.11	42.47	46.44	53.1	66.32	73.7	77.92	75.5	68.32	54.11	47.73	39.47	56.68
1985	34.08	37.75	49.94	59.03	66.6	74.03	78.73	78.47	69.03	56.94	47.22	36.27	57.34
1986	43.95	42.07	53.53	59.92	65.47	72.4	78.94	76.77	69.3	55.77	44.07	37.08	58.27
1987	34.66	41.79	45.18	55.05	64.31	73.02	79.29	75.66	67.92	59.89	47.18	35.85	56.65
1988	33.98	42.41	47.5	54.9	64.97	74.23	76.68	76.42	67.05	59.29	50.35	37.82	57.13
1989	41.27	36.84	53.35	60.03	69.18	71.05	77.6	75.84	67.68	60.69	50.27	33.16	58.08

TUCUMCARI 4 NE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1990	38.71	42.02	47.48	56.8	64.13	82.27	77.66	76.06	71.73	58.47	50.22	34.73	58.36
1991	34.73	46.59	49.94	57.82	67.82	75.67	75.79	74.82	66.65	59.55	42.28	39.69	57.61
1992	37.66	45.62	51.76	60.2	64.58	71.8	78.4	75.47	71.2	61.87	42.78	37.95	58.27
1993	36.82	40.45	49.77	56.98	66.29	74.9	80.32	77.06	69.65	57.92	43.07	40.85	57.84
1994	39.42	41.32	50.48	57.38	66.26	79.18	80.05	79.66	71.42	59.34	49.25	44.61	59.86
1995	40.48	47.3	49.73	55.17	64.35	73.63	78.77	80.24	69.6	60.35	51.55	41.84	59.42
1996	38.73	45.05	47	59.07	73.39	76.8	77.53	75.55	67.25	58.02	48.15	40.95	58.96
1997	35.37	40.12	52.4	50.43	64.77	73.93	79.79	76.37	72.73	59.37	44.88	35.1	57.11
1998	42.11	42.52	46.27	54.48	68.73	77	81.23	76.23	74.48	61.4	51.28	41.03	59.73
1999	43.42	48.89	49.81	55.87	64.4	74.18	80.21	79.13	69.18	60.21	53.78	40.19	59.94
2000	43.81	49.47	51.16	60.32	72.23	76.32	81.87	82.65	75.2	59.18	41.18	36.19	60.8
2001	34.71	44.46	46.79	62.52	66.42	76.55	83.77	78.92	72.77	60.94	52.1	41.6	60.13
2002	40.82	41.16	47.11	61.73	69.21	81.15	79.63	80.55	70.8	56.32	46.13	39.76	59.53
2003	42.55	41.36	51.47	60.58	70.26	72.9	83.52	80.34	70.47	63.73	49.17	42.95	60.77
2004	41.82	39.22	53.84	56.43	70.92	76.48	76.42	78.08	-----	-----	-----	-----	
Period of Record Statistics													
MEAN	38.23	42.01	48.88	57.42	66.13	75.43	78.94	77.25	70.51	59.52	47.3	39.11	58.39
S.D.	4.18	3.99	3.77	2.95	2.58	2.6	2.11	2.11	2.23	2.39	3.57	3.86	1.31
SKEW	-0.3	-0.27	0.04	0.18	0.48	0.25	0.15	0.22	0.29	-0.07	-0.2	-0.35	0.11
MAX	47.03	50.67	57.87	64.37	73.39	82.27	83.77	82.65	75.2	65.74	54.28	48.26	61.26
MIN	27.45	30.82	40.28	50.43	59.81	69.67	74.65	72.69	65.8	52.6	37.5	29.58	55.49
NO YRS	95	98	98	98	97	98	96	97	95	95	94	96	

SAN JON													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1914	45.55	40.55	47.65	57.37	64.02	75.85	76.34	75.83	74.05	58.5	49.03	33.5	58.19
1915	33.45	41.46	39.63	57.65	62.55	73.55	77.02	72.45	70.07	59.39	49.35	38.31	57.87
1916	50.75	52.55	57.82	55.32	68.83	77.05	80.23	76.42	71.98	58.45	45.37	-----	65.32
1917	38.05	42.8	46.45	56.2	59.74	75.6	82.77	77.25	71.02	60.27	-----	40.85	61.01
1918	32.52	45.48	52.58	53.73	66.28	75.04	79.14	77.57	66.08	60.77	41.96	28.97	53.65
1919	28.32	40.33	47.34	55.81	62.12	-----	-----	77.28	70.08	-----	-----	-----	54.47
1920	35.29	42.59	44.96	50.61	-----	71.61	77.73	73.26	71.55	59.96	-----	38.88	56.99
1921	-----	-----	49.94	54.08	65.12	70.38	75.88	-----	74.02	58.3	51.46	45.04	61.27
1922	33.27	39.78	39.89	54.25	64.04	74.43	-----	-----	-----	63.21	46.07	42.66	47.24
1923	44.65	37.54	44	57.02	67.23	74.79	79.12	-----	-----	53.63	43.98	26.95	50.46
1924	35.83	41.63	41.03	-----	61.69	-----	76.54	78.82	68.34	59.83	50.54	32.34	57.14
1925	34.39	45.08	52.73	58.93	67.52	-----	-----	74.26	-----	-----	-----	-----	55.48
1926	32.34	46.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	39.37
1927	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1928	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1929	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1930	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1931	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	45.8	38.97	42.38

1932	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1933	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1934	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1935	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1936	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1937	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1938	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1939	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1940	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1941	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1942	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1943	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1944	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1945	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1946	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1947	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1948	34.36	37.36	41.58	61	66.66	75.22	80.42	77.05	72.62	59.05	43.3	43.67	57.69
1949	30.26	41.28	50.5	55.12	65.87	72.7	78.4	76.29	70.42	58.47	51.7	38.08	55.52
1950	42.23	46.91	49.68	59.23	66.37	77.23	75.06	75.15	67.22	65.16	49.05	40.69	59.5
1951	38.19	44.46	48.45	55.4	65.9	73.8	83.13	80.47	73.13	60.63	44.05	40.87	59.04
1952	43.19	44.16	46.58	57.22	66.48	81.45	79.23	80.97	71.41	59.1	42.18	37.39	59.11
1953	45.57	40.35	53.41	56.73	63.95	85.72	81.02	76.95	72	60.21	47.85	36.62	60.03
1954	39.6	48.96	48.53	62.91	64.84	78.88	82.76	78.7	75.16	60.39	49.08	40.82	61.97
1955	37.24	38.57	49.43	58.07	64.18	72.41	77.29	77.05	71.17	60.02	47.38	44.16	58.08
1956	41.87	37.12	50.33	56.52	71.97	79.57	79.58	78.97	75.5	63.53	44.32	40.85	60.01
1957	40.94	49.39	47.94	53.45	63.76	75.17	80.41	78.21	68.6	58.08	42.34	44.18	58.54
1958	36.29	42.2	40.34	52.75	68.05	77.87	79.4	78.13	70.75	57.53	47.98	39.42	57.56
1959	34.73	41.61	47.24	56.7	67.88	75.83	77.15	77.58	70.91	56.21	45.83	39.11	57.57
1960	32.6	34.34	45.79	58.45	64.64	75.19	74.13	76.43	69.6	58.35	47.79	33.57	55.91
1961	34.1	40.66	48.15	59.43	65.68	73.09	75.84	74.68	66.32	58.77	42.17	36.94	55.84
1962	33.84	46	45.98	57.82	71.97	73.8	78.81	80.27	72.47	61.61	48.4	40.77	59.31
1963	31.68	41.32	49.06	62.73	70.56	76.67	82.97	78.63	73.58	65.81	50.35	34.81	59.85
1964	38.87	33.05	45.87	56.95	68.97	77.72	83.4	79.74	71.87	62.73	48.47	40.97	59.05
1965	42.84	39.25	41.35	59.62	66.53	73.73	80.66	77.11	69.42	59.31	53.55	42.35	58.81
1966	31.69	37.64	51.94	58.87	69.53	75.63	84.15	74.74	70.4	58.08	50.8	36.39	58.32
1967	41.52	41.68	54.81	62.17	65.95	74.47	77.39	74.65	70.17	62.85	48.18	35.61	59.12
1968	40.82	40.69	48.48	55.67	64.9	77.82	78.42	78.15	71.48	62.97	46.3	40.21	58.83
1969	45.69	42.54	41.53	59.98	67.26	73.23	81.39	80.42	71.05	55.97	46.63	40.68	58.86
1970	35.47	44.3	43.95	54.38	69.18	73.78	79	78.81	69.98	54.1	48.37	44.66	58
1971	38.44	40.48	50.05	57.52	65.89	77.23	79.05	73.23	68.68	58.32	48.17	40.52	58.13
1972	40.52	45.24	54.48	62.13	66.71	77.53	77.39	74.35	68.93	58.24	39.4	37.63	58.55
1973	34.9	39.91	-----	50.65	63.48	75.55	77.71	79.61	67.6	61.82	52.73	39.5	58.5
1974	38.53	43.32	56.4	59.25	73.44	78.15	80.66	75.42	66.03	59.97	46.75	37.1	59.59
1975	38.35	38.82	48.6	55.95	65.1	75.57	75.66	78.21	67.8	62.02	46.68	41.94	57.89
1976	39	49.69	49.6	60.5	64.26	76.2	77.35	78.68	69.98	54.53	42.58	39.56	58.5

1977	32.97	43.25	48.6	58.42	69.18	80.18	81.42	79.71	73.48	62.03	49.52	44.15	60.24
1978	34.27	36.05	50.5	61.8	66.45	76.68	81.74	77.82	71.05	60.76	-----	35	59.29
1979	29.15	42.61	49.45	57.23	66.02	73.42	79.76	76.61	72.17	62.79	42.3	40.95	57.7
1980	38.55	42.26	47.87	54.65	64.68	82.24	85.89	79.95	71.79	59.4	45.42	46.37	59.92
1981	41.13	45.43	49.58	63.85	66.47	78.57	80.85	75.31	69.65	59.06	51.95	42.81	60.39
1982	41.16	40.59	50.48	57.27	66.13	73.13	79.16	78.4	72.7	59.45	46.58	36.77	58.49
1983	37.44	40.43	48.24	52.53	62.6	72.67	81.03	81.61	76	61.79	50.67	31.82	58.07
1984	36.29	44.19	46.94	54.6	68.76	75.82	78.95	76.19	69.82	56.52	48.27	41.39	58.14
1985	34.11	40.18	51.08	59.98	68.24	76.25	80.52	79.82	70.62	59.53	48.35	35.9	58.72
1986	43.89	40.75	53.87	60.35	66	73.6	80.94	77.5	71.33	57.16	44.63	37.48	58.96
1987	35	42.7	46.37	56.48	65.31	74.63	79.89	76.48	68.35	60.39	46.33	36.15	57.34
1988	34.74	41.64	47.52	56.37	65.63	74.43	76.32	77.06	68.3	60.45	50.35	38.5	57.61
1989	41.9	36.88	55.55	62.82	69.39	72.38	78.05	76.39	67.8	61.47	49.22	33.84	58.81
1990	38.35	41.39	48.34	57.97	65.53	83.55	77.58	76.68	71.97	59.47	49.63	35.11	58.8
1991	34.18	46.29	50.03	58.32	69.13	75.58	76.21	75.27	66.75	59.5	43.07	39.66	57.83
1992	37.23	45.45	51.81	61.03	64.42	72.17	78.39	74.32	70.65	61.71	42.7	38.45	58.19
1993	37.74	39.59	49.16	56.97	66.39	75.23	80.13	76.85	70.22	57.82	44.18	-----	59.48
1994	39.18	42.91	50.42	58.43	66.84	79.7	79.02	78.84	71.88	59.15	49.38	43.31	59.92
1995	40.6	47.39	50.16	56.12	65.23	74.25	79.74	80.39	70.2	61.32	51.1	40.98	59.79
1996	39.52	45.59	47.55	60.08	74.27	77.58	78.81	76.26	67.55	58.94	47.45	41.34	59.58
1997	35.63	39.7	52.23	50.6	64.56	74.47	80.11	76.87	73.27	59.63	44.18	33.55	57.07
1998	41.79	42.41	46.03	54.7	69.47	77.82	81.42	76.56	75.38	61.42	50.63	40.31	59.83
1999	43.32	48.04	49.21	55.2	64.21	74.5	80.18	78.85	69.62	60.37	53.43	39.27	59.68
2000	43.68	50.72	51.73	61.8	72.18	75.93	80.45	82.11	74.79	59.47	43.73	39.18	61.31
2001	38.26	43.86	46.85	62.98	66.91	77.88	83.87	79.31	72.95	61.83	52.43	42	60.76
2002	41.76	41.41	48.35	62.73	69.58	80.27	80.32	80.61	71.78	56.66	45.73	38.55	59.81
2003	42.5	41.41	52.32	59.83	70.32	72.73	82.6	80.58	71.35	64.15	50.72	-----	62.59
2004	41.97	40.26	54.89	56.22	69.94	75	-----	-----	-----	-----	-----	-----	
Period of Record Statistics													
MEAN	37.84	42.08	48.67	57.8	66.67	75.93	79.49	77.53	70.89	59.77	47.31	38.97	58.82
S.D.	4.21	3.47	3.69	3.06	2.82	2.9	2.4	2.19	2.29	2.4	3.29	3.82	1.05
SKEW	-0.07	0.1	-0.37	-0.06	0.44	0.98	0.2	-0.13	0.08	-0.09	-0.17	-0.71	-0.06
MAX	45.69	50.72	56.4	63.85	74.27	85.72	85.89	82.11	76	65.81	53.55	46.37	61.31
MIN	28.32	33.05	39.63	50.6	59.74	70.38	74.13	72.45	66.03	53.63	39.4	26.95	55.91
NO YRS	68	67	65	64	65	65	64	63	64	64	64	61	

RAGLAND 3 SSW													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1959	-----	-----	-----	-----	64.4	72.88	73.39	73.81	68	54.48	42.63	38.37	61
1960	32.42	33.48	45.26	55.97	62.23	71.32	69.94	70.1	64.78	53.76	46.68	31.77	53.14
1961	33.71	39.43	45.5	53.43	63.97	71.15	71.71	71.74	63.27	56.18	40.65	35.02	53.81
1962	32.15	44.36	41.68	55.55	65.84	69.23	73.4	75.08	67.33	58.58	45.75	38.89	55.65
1963	30.45	41.66	47.31	58.05	65.16	70.45	77.6	74.35	69.37	62.68	48.05	35.19	56.69
1964	36.48	31.46	43.21	54.22	64.27	72.23	77.79	75.76	67.78	59.02	45.18	38.47	55.49
1965	40.79	37.29	39.05	56.93	62.32	69.6	75.66	72.52	66.57	58.1	51.73	40.44	55.92

RAGLAND 3 SSW													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1966	31.19	35.36	48.79	55.4	64.69	70.85	78.35	69.89	67.18	55.56	49.15	35.53	55.16
1967	38.6	40.39	52.06	59.5	62.4	70.97	73.89	70.39	65.92	58.9	46.22	31.39	55.89
1968	36.95	39.5	45.79	51.93	62.18	72.87	73.47	73.45	65.95	59.03	43.32	38.11	55.21
1969	42.31	40.34	38.32	56.95	63.52	70.18	77.76	76.35	66.6	52.35	45.9	40.02	55.88
1970	34.65	44.09	42.48	53.41	65.61	71.03	75.79	74.66	64.97	52.31	46.73	41.48	55.8
1971	38.21	39.68	48.34	56.02	62.19	72.42	74.85	70.03	65.3	55.79	46.92	38.03	55.65
1972	37.65	43.34	52.1	57.77	63.32	70.92	71.85	71.11	65.68	56.13	38	36.56	55.37
1973	33.16	37.82	43.73	48.36	60.16	69.83	72.81	74.19	64.82	58.44	49.28	37.08	54.14
1974	37.66	41.2	52.5	54.9	68.29	74.05	75.53	71.71	61.87	56.08	43.52	34.63	55.99
1975	36.37	37.45	44.97	51.62	60.32	71.95	71.71	73.4	63.87	57.03	44.27	39.4	54.36
1976	35.79	46.33	45.42	55.43	61.1	71.98	72.24	72.98	65.53	51.98	39.65	36.52	54.58
1977	31.19	41.25	44.89	54.52	63.77	75.02	76.53	75.13	70	57.92	46.23	41.69	56.51
1978	30.97	33.66	47.24	58.78	62.66	73.17	77.9	73.21	66.08	57.68	44.82	31.48	54.8
1979	27.11	39.23	46.21	53.85	61.63	69.12	75.61	71.92	67.62	60.15	40.27	37.84	54.21
1980	37.15	38.84	43.94	51.55	60.27	77.67	80.52	75.52	67.98	54.37	42.07	44.66	56.21
1981	37.6	42.25	45.34	58.88	62.32	75.5	76.19	71.15	66.33	55.61	50.37	41.19	56.89
1982	38.03	38.32	48.08	55.15	62.84	70.68	75.65	74.76	68.52	55.37	44.08	33.56	55.42
1983	35.56	39.59	45.84	49.53	59.79	69.82	76.19	76.81	71.18	58.39	47.65	29.6	55
1984	33.27	41.43	45.62	-----	-----	-----	-----	72.34	65.37	52.95	44.05	36.95	49
1985	31.82	36.79	46.95	56.23	63.85	71.02	75.21	75.44	65.55	56.11	45.47	34.58	53.07
1986	41.03	38.86	50.24	57.07	62.94	70.5	75.82	73.6	66.47	54.69	41.13	35.05	55.62
1987	33.44	39.86	43.27	52.83	61.76	70.93	75.08	73.24	65.42	58.65	43.77	33.23	54.29
1988	32.26	39.72	44.53	54.13	62.58	71.17	72.73	72.55	64.97	58.34	46.45	35.16	54.55
1989	39.26	34.95	50.94	59.03	67.47	70.58	75.05	73.34	65.13	58.76	46.73	32.44	56.14
1990	35.69	39.11	47.03	54.6	62.63	79.03	74.05	71.92	68.42	55.82	47.05	33.47	55.74
1991	32.56	43.07	46.31	55.57	65.87	72.58	72.6	71.4	63.05	55.69	40.75	36.61	54.67
1992	34.05	42.62	48.13	56.88	61.34	69.5	75.23	71.58	67.85	59.19	40.72	34.39	55.12
1993	35.32	38.36	47.13	54.78	63.24	72.38	76.08	73.19	65.22	54.11	40.58	38.32	54.89
1994	36.5	39.2	47.02	55	64.14	76.48	77.31	75.68	68.82	56.55	46.23	40.9	56.33
1995	38.15	45.38	46.92	53.33	62.08	70.55	76.87	76.44	66.73	57.84	-----	38.79	57.55
1996	37.1	41.71	44.29	57.17	70.58	74.48	75.45	72.73	64.15	54.58	45.65	39.84	56.48
1997	32.39	37.5	48.6	48.32	62.56	70.82	75.82	73	68.95	56.05	42.07	30.9	53.91
1998	37.69	40.3	42.79	51.37	66.19	73.62	77.71	72.82	71.48	-----	47.47	37.31	56.25
1999	40.6	44.18	46.37	52.72	61.27	70.53	74.6	74.35	66.52	56.67	50.15	35.39	56.11
2000	40.34	46.67	48.16	57	68.53	72.78	76.62	76.9	70.32	56	38.25	32.9	55.61
2001	31.24	40.34	45.55	58	63.74	74.07	79.13	74.27	68.55	57.5	47.57	37.57	56.46
2002	37.9	38.38	45.05	59.88	66.06	76.42	75.29	75.9	67.17	53.52	42.62	35.79	56.16
2003	39.82	38.78	47.81	56.18	65.79	69.7	79.21	75.68	66.83	59.98	46.3	38.39	57.04
2004	38.85	35.79	50.71	52.22	66.06	72.07	-----	-----	-----	-----	-----	-----	52.62
Period of Record Statistics													
MEAN	35.68	39.76	46.25	55.04	63.63	72.08	75.37	73.48	66.65	56.57	44.82	36.55	55.38
S.D.	3.43	3.3	3.04	2.83	2.38	2.32	2.29	1.91	2.09	2.33	3.28	3.28	0.94
SKEW	-0.21	-0.12	-0.18	-0.52	0.79	1.2	-0.14	-0.07	0.21	0.05	-0.17	0.03	-0.27

RAGLAND 3 SSW													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
MAX	42.31	46.67	52.5	59.88	70.58	79.03	80.52	76.9	71.48	62.68	51.73	44.66	57.04
MIN	27.11	31.46	38.32	48.32	59.79	69.12	69.94	69.89	61.87	51.98	38	29.6	53.14
NO YRS	45	45	45	43	44	44	43	45	45	44	44	45	

Precipitation Data

NEWKIRK													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1940	0	0	0	0	0	0	0	0	0.11	0.21	1.3	0.31	1.93
1941	0.27	0.81	2.81	2.04	5.43	3.01	4.64	2.36	11.83	3.99	0.11	0.16	37.46
1942	0.22	1	0.2	5.93	0.77	0.89	1.96	5.36	2.26	1.58	0	0	20.17
1943	0	0.1	0	0.05	0.6	3.6	3.3	1.16	0.87	0.37	0.24	1.8	12.09
1944	0.51	0.27	0.05	0.24	0.93	3.08	0.23	2.72	2.27	0.15	1.24	0.15	11.84
1945	0.4	0	0.3	0.11	0.51	0.15	3.19	2.86	0	1.43	0	0	8.95
1946	0.02	0	0.66	1.08	4.29	0.44	2.23	2.47	3.99	1.14	0	0	16.32
1947	0.51	0	0.17	0.68	5.26	0.55	0.62	1.65	0.38	0.46	0.56	0	10.84
1948	0.56	1.94	1.17	0.69	1.99	0.7	1.12	0.75	0	1.03	0.15	0.02	9.56
1949	0.73	2.25	0.25	1.82	2.2	3.19	3.51	1.08	1.81	0.15	0.14	0.48	15.8
1950	0	0	0	0.45	0.66	1.84	4.63	0.69	3.34	0	0	0.06	11.67
1951	0.34	0.37	0.42	0.14	1.89	1.28	0.76	1.63	0.25	0.28	0.18	0.47	8.01
1952	0.24	0.43	0.85	1.24	0.75	1.5	2.62	2.1	0.82	0	1.16	0.4	12.11
1953	0.55	0.15	0.51	0.06	0.55	0.5	1.58	3.08	0	0.57	0.61	0.85	9.01
1954	0.21	0.13	0	0.11	0.57	0	0.5	3.01	1.72	2.9	0	0.23	9.38
1955	0	0.09	0.22	0.28	1	0.1	1.57	0.57	0.93	0	0	0	4.76
1956	0.12	0.35	0	0.77	0.34	0.81	0.83	1.91	0	0	0	0	5.13
1957	0.03	0.35	1.25	1.03	2.91	0	1.46	1.36	0.05	0	0	0	8.44
1958	0	0	0	0	0	0	0	2.13	2.18	1.19	0.22	0.3	6.02
1959	0.16	0.09	0.06	0.6	1.69	2.8	1.26	6.4	0	1.67	0.09	3.96	18.78
1960	0.93	0.44	0.77	0	0.37	4.61	6.69	3.71	1.14	5.31	0.03	1.87	25.87
1961	0.31	0.43	0.9	1.27	0.79	0.93	2.86	3.53	2.07	1.07	0.68	0.77	15.61
1962	0.15	0.01	0.29	0.67	0.27	1.14	4.94	1.25	2.94	0.33	0.25	0.74	12.98
1963	0.15	1.15	0.26	0.1	1.62	1.21	0.2	4.43	0	0	0	0	9.12
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0.51	0	0.21	0.3	5.94	0.3	3.12	0.07	0	0	0.2	7.23
1967	0	0	0	0	1.02	2.28	4.15	5.48	0.82	0.24	0	0.67	14.66
1968	0.72	0.28	1.1	0.27	0.97	0.06	3.23	2.27	0.19	0.7	0.56	0.08	10.43
1969	0	0.34	0.58	0.9	1.86	5.56	1.76	4.52	2.21	2.68	0.28	0.57	21.26
1970	0.07	0	0.43	0.66	0.85	1.2	2.1	1.29	1.28	1.65	0	0	9.53
1971	0.15	0.24	0.22	0.02	0.06	0.45	3.6	4.37	1.83	0.99	1.32	1.26	14.51
1972	0.02	0.02	0.03	0	0.63	1.92	2.3	6.58	0.72	1.85	1.38	0.31	15.76

NEWKIRK													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1973	0.52	0.46	1.89	2.71	0.82	1	2.15	2.7	0.43	0.98	0	0.71	14.37
1974	0.68	0.4	0.33	0.17	0	0.38	1.36	1.93	2.32	3.54	0.36	0.21	11.68
1975	0.5	0.63	0.13	0.59	0.98	0.96	2.98	0.66	2.99	0	0.64	0.07	11.13
1976	0.12	0.29	0.15	0.88	1.5	0.72	3.21	1.28	1.36	0.39	0.32	0	10.22
1977	0.37	0.12	0.18	2.15	1.56	0.62	3.33	3.54	0.5	0.45	0.63	0.02	13.47
1978	0.8	0.33	0.39	0.17	1.44	5.12	1.65	1.04	0.98	0.89	2.27	0.75	15.83
1979	0.76	0.3	0.37	0.92	3.09	3.04	4.73	2.96	0.74	1.23	0.29	0.44	18.87
1980	0.12	0.84	1.06	1.13	2.96	0.02	1.21	3.26	3.52	0	0.54	0.05	14.71
1981	0.06	0.17	0.64	0.23	1.6	2.55	4.29	4.08	1.28	1.37	0.27	0	16.54
1982	0.19	0.21	0.07	0.41	0.66	0.85	3.95	2.83	4.42	1.66	0.8	1.07	17.12
1983	1.23	0.72	1.1	0.56	0.71	0.87	1.01	1	0.67	2.25	0.23	0.55	10.9
1984	0.35	0	0.69	0.44	1.87	1.85	1.73	3.41	1.31	3.4	1.61	0.69	17.35
1985	0.19	0.5	2.36	0.8	1.8	1.69	1.88	3.28	2.93	5.68	0.53	0	21.64
1986	0.07	1.23	0.21	0.88	2.43	2.17	0.38	3.02	3.27	2.56	2.71	0.92	19.85
1987	0.73	1.44	0.84	0.36	1.68	3.04	0.37	3.8	0.89	0.36	0.22	0.64	14.37
1988	0.34	0	0.16	1.08	1.02	1.34	2.89	2.22	1.62	0.43	0.29	0.56	11.95
1989	0.05	0.24	0.07	0.03	0.05	1.56	1.48	3.23	0.29	0.09	0	0.25	7.34
1990	0.86	1.3	0	0.31	0.71	0.52	7.63	5.01	2.05	0.93	0.03	0.03	19.07
1991	0.57	0	0.96	0	2.72	0.35	4.48	5.31	0	0.22	1.38	0.98	16.97
1992	0.48	0.5	0.22	0.77	3.1	2.29	0.89	1.12	0.73	0.11	0.27	0.6	11.08
1993	0.25	0.55	1.37	0.2	2.08	2.14	5.17	1.65	0.97	1.09	1.17	0	16.64
1994	0.05	0.08	0.9	0.55	3.21	1.52	1.14	0.33	1.58	0.89	0.35	0.45	11.05
1995	0.05	0	1	0.61	1.65	1.19	1.37	1.36	4.29	0.42	0	0.41	11.74
1996	0.22	0.1	0	0	0	3.46	4.98	1.71	1.11	1.32	0.41	0.2	13.51
1997	0.7	0.45	0.03	5.57	2.3	4.38	4.69	3.58	3.44	0.23	0.8	3.05	29.22
1998	0.1	0.47	0.95	1.15	0	0.02	2.91	2.37	0.88	3.62	0.53	0.45	13.45
1999	0.6	0	1.28	5.72	3.31	1.55	1.76	3	1.35	0.07	0	0.79	19.43
2000	0	0	2.76	0.45	0.59	2.88	4.33	2.42	0	6.36	0.33	1.17	21.29
2001	1.08	0.89	2.14	0	1.68	0.74	0.42	0	0.21	0.33	1.33	0.38	9.2
2002	0.9	0	0.04	0.58	0.33	0.88	1.52	0.78	6.07	1.48	0	0.95	12.58
2003	0	0.27	0.74	0	0.42	3.51	1.02	4.35	0.93	1.41	0.73	0	13.38
Period of Record Statistics													
MEAN	0.35	0.42	0.63	0.88	1.46	1.72	2.52	2.68	1.69	1.26	0.5	0.56	14.75
S.D.	0.32	0.48	0.68	1.29	1.22	1.45	1.69	1.51	1.91	1.46	0.59	0.72	6.13
SKEW	0.84	1.87	1.57	2.88	1.32	1.07	0.77	0.62	2.92	1.76	1.69	2.79	1.4
MAX	1.23	2.25	2.81	5.93	5.43	5.94	7.63	6.58	11.83	6.36	2.71	3.96	37.46
MIN	0	0	0	0	0	0	0.2	0.33	0	0	0	0	4.76
NO YRS	57	58	58	57	60	60	59	59	57	59	58	56	

MCCARTY RANCH													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1983	0	0	0	0	0	0	0	0	0	0	0.58	0.67	1.25
1984	0.51	0.11	1.25	1.41	1.13	2.59	1.9	4.05	0.27	3.03	0.65	0.26	17.16
1985	0.47	0.39	1.86	1.7	2.85	2.16	2.04	0.73	2.88	3.39	0.06	0.03	18.56
1986	0	0.59	0.31	0.4	5.58	2.19	1.23	2.55	1.53	2.6	2.28	0.55	19.81
1987	1.55	2.2	0.18	0.74	4.53	3.5	0.07	6.89	2.66	0.15	0.56	0.66	23.69
1988	0.18	0	0.24	1.17	2.25	2.7	3.73	1.74	3.95	0.85	0.06	0.42	17.29
1989	0.24	0.32	0.02	0.1	2.05	5.79	2.44	4.8	2.4	0.43	0	0.11	18.7
1990	1.68	2.31	0.69	0.18	0.54	0.06	2.6	2.57	2.17	0.27	1.07	0.25	14.39
1991	0.66	0	1.37	0.05	2.36	3.12	6.54	4.05	4.81	0.2	1.11	1.52	25.79
1992	0.46	0.35	0.36	0.5	2.07	2.45	3.64	2.55	0.61	0.6	0.3	0.11	13.89
1993	0.99	0.62	1.28	0.12	2.83	4.7	2.36	2.03	0.24	0.39	0.3	0.07	15.93
1994	0.15	0	0.58	2.59	3.36	1.37	2.1	2.1	0.29	2.21	0.6	0.54	15.89
1995	0.31	0.2	0.49	0.5	2.52	1.52	4.62	1.79	3.45	0.07	0.04	0.37	15.88
1996	0.06	0.13	0.02	0	1.73	3.05	3.79	2.89	1.6	0.99	0.95	0.11	15.32
1997	0.41	0.57	0.04	4.4	1.26	3.65	2.69	2.9	1.73	1.09	1.05	1.6	21.39
1998	0	0.9	1.71	0.18	0.38	0.1	5.35	2.6	0.42	4.4	0.29	0.14	16.47
1999	0.64	0	0.43	1.52	3.83	1.83	0.88	1.93	1.31	0.49	0.1	0.38	10.9
2000	0.06	0	2	0.33	0.76	1.52	1.68	1.36	0.17	5.13	0.64	0.57	14.22
2001	0.81	0.67	1.54	0.38	2.05	0.91	2.69	2.77	1.17	0.01	1.47	0.34	14.81
2002	0.44	0.05	0.09	1.41	0.2	0.75	0.58	1.24	2.51	0.82	1.23	0.92	7.15
2003	0	0.23	0.37	0.7	1.38	4.65	0.24	0.58	1.04	0.51	0.94	0	10.64
Period of Record Statistics													
MEAN	0.48	0.48	0.76	0.9	2.18	2.31	2.66	2.71	1.76	1.48	0.67	0.5	17.83
S.D.	0.48	0.66	0.68	1.12	1.39	1.48	1.66	1.43	1.38	1.59	0.58	0.44	3.36
SKEW	1.26	1.94	0.54	1.93	0.7	0.53	0.58	1.38	0.64	1.05	1.03	1.38	1.09
MAX	1.68	2.31	2	4.4	5.58	5.79	6.54	6.89	4.81	5.13	2.28	1.6	25.79
MIN	0	0	0.02	0	0.2	0.06	0.07	0.73	0.17	0.01	0	0.03	14.22
NO YRS	20	20	19	18	20	19	19	19	18	18	20	19	

TUCUMCARI 4 NE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1904	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1905	0.43	1.15	2.96	2.1	2.25	2.5	4.07	1.01	2.5	0	4	1	23.97
1906	0.7	0.7	0.05	1.79	1	0.46	4.21	2.92	0.33	0.62	1.66	1.61	16.05
1907	0.24	0	0	2.31	2.3	3.36	2.56	3.92	0.08	1.43	0.75	0.64	16.84
1908	0.2	0.84	0	1.6	0.24	0.44	3.45	1.78	1.03	0.93	0.98	0	11.49
1909	0	0	1.72	0.48	0.97	2.42	2.03	1.04	0.85	1.9	1.59	0.2	13.2
1910	0.09	0.04	0.09	0.76	0.16	0.26	1.77	5.88	0.49	0.45	0.22	0.15	10.36
1911	0.13	1.7	0.17	0.68	0.92	1.13	2.9	5.01	2.75	1.89	0.4	0.74	18.42
1912	0	2.4	0.15	1.01	1.5	1.57	3.11	2.55	1.16	0.1	0	0.13	13.68
1913	0.28	0.64	0.16	4	1.21	3.05	0.56	1.97	1.58	0.08	2.09	0	15.62

1914	0.16	0.32	0.32	2.18	9.36	1.3	4.46	1.02	1.31	3.75	0	0.86	25.04
1915	0.7	0.98	1.03	4.27	1.36	0.82	3.13	2.28	2.94	0.67	0	0.27	18.45
1916	0.7	0	0.09	1.55	0.56	0.63	0.98	4.43	0.56	0.78	0.29	0.32	10.89
1917	0.58	0.11	0.12	0.32	1.82	0.9	0.74	6.11	2.74	0.16	0.62	0.04	14.26
1918	0.46	0.13	0.21	1.14	0.21	0.8	2.54	1.02	2.85	2.6	0.51	2.6	15.07
1919	0.04	0.32	3.69	3.61	5.85	6.39	3.16	2.53	4.16	2.31	0.71	0.93	33.7
1920	0.76	0.15	0.26	0.2	2.55	3.91	1.52	2.12	1.44	3.5	0.49	0	16.9
1921	1.11	0	0.83	0	8.72	5.88	3.56	1.95	0.75	0.21	0	0	23.01
1922	0.06	0.13	1.37	2.64	2.04	1.24	1.65	0.67	1.2	0.37	1.36	0	12.73
1923	0	0.96	1.04	3.35	1.92	3.55	0.63	5.64	1.78	7.51	1.69	1.64	29.71
1924	0	0.19	0.6	0.63	1.67	2.07	1.93	3.79	1.31	1.09	0.04	0.47	13.79
1925	0.3	0.05	0	0.38	1.85	1.33	3.09	3.36	2.32	2.52	0.24	0.25	15.69
1926	0.14	0.1	2.04	3.13	5.25	1.87	2.24	1.59	1.57	0.58	0.02	1.23	19.76
1927	0.02	0.24	0.22	0.03	0	4.03	1.85	4.99	1.92	0.18	0.02	0.09	13.59
1928	0	0.75	0.09	1.66	2.26	1.1	1.92	2.92	0.12	3.08	2.04	0.77	16.71
1929	0	0.36	2.05	0.48	2.83	0.38	0.7	1.9	0.67	0.67	1.32	0.1	11.46
1930	0.11	0	0.38	0.12	0.43	3.49	2.78	1.41	0.61	2.44	0.92	0.19	12.88
1931	0.62	1.81	1.04	2.57	2.54	0.17	3.32	2.87	1.16	1.31	0.44	0.24	18.09
1932	0.68	0.5	0.27	1.32	2.2	3.27	2.35	2.28	2.34	0.57	0.03	0.7	16.51
1933	0	0.26	0	0.17	1.35	1.3	3.67	8.38	0.04	0.36	1.05	0	16.58
1934	0	0.15	0.08	0.01	0.53	0.91	1.34	1.83	0.03	0.49	0.73	0.03	6.13
1935	0	0	0.56	0.02	3.02	0.64	2.42	3.64	0.66	0.27	1.07	0.24	12.54
1936	0.63	0.07	0	0.01	1.74	2.01	4.4	2.02	1.42	0.2	0	0.62	13.12
1937	0.06	0.08	1.23	0.88	5.72	2.42	0.87	0.86	2.09	1.84	0.06	0.59	16.7
1938	0.13	1.3	0.19	0.95	2.35	1.48	0.99	0.24	2.06	1.28	0.34	0.55	11.86
1939	1.25	0.22	0.34	1.04	2.48	0.3	1.58	1.88	1.3	0.81	0	0.96	12.16
1940	0.18	0.51	0.94	0.71	2.44	0.28	0.79	3.54	0.32	0.02	2.74	0.24	12.71
1941	0.75	0.39	2.32	2.35	7.4	3.41	3.15	1.29	7.23	6.3	0.14	0.21	34.94
1942	0.03	0.08	0.83	3.87	0.37	1.98	1.37	1.17	2.42	2.16	0	0.49	14.77
1943	0.06	0.07	0	0.16	0.44	3.69	2.11	1.26	0.34	0.42	0.23	2.45	10.79
1944	0.5	0.46	0.02	1.14	5.55	1.19	1.94	3.87	1.06	0.24	0.44	1.63	18.04
1945	0.83	0.15	0.47	0.3	1.78	0.22	1.05	6.25	1.73	1.48	0	0	14.26
1946	0.02	0.08	0.13	0.12	0.76	0.27	0.78	1.88	1.88	1.29	1.21	0	8.42
1947	0.29	0	0.59	0.62	5.02	0	1.28	1.38	0.02	0.15	0.67	0.96	10.98
1948	1	1.84	1.55	0.13	2.43	2.41	1.53	3.77	0	0.55	1.2	0	16.41
1949	0.95	1.83	0.75	1.94	1.66	4.1	4.4	0.64	2.86	0.41	0.05	0.34	19.93
1950	0	0	0	0.46	0.19	1.77	11.19	0.84	2.41	0.15	0	0.26	17.27
1951	0.82	0.3	0.85	0.24	1.23	1.81	1.46	0.12	0.08	0.76	0.28	0.29	8.24
1952	0.39	0.3	0.92	1.67	0.85	1.33	2.38	4.56	0.43	0	1.05	0.41	14.29
1953	0.11	0.32	0.33	0.33	1.32	0.16	3.67	2.78	0	0.56	0.53	0.98	11.09
1954	0.2	0.11	0.02	0.56	3.16	1.1	1.56	2.14	1.98	2.64	0.5	0.03	14
1955	0.28	0.07	0.14	0.79	2.11	0.5	2.12	0.84	2.52	0.08	0.11	0.1	9.66
1956	0.01	0.66	0.05	0.21	2.41	1.7	3.55	1.61	0.06	0.16	0.11	0.01	10.54
1957	0.28	0.26	1.12	1.33	1.88	0.56	2.84	1.76	0.37	1.55	0.72	0.04	12.71

1958	1.1	0.24	2.08	1.89	1.94	2.79	2.73	2.77	2.29	0.63	0.42	0.63	19.51
1959	0.39	0.11	0.15	0.67	1.34	2.66	0.9	5	0	2.57	0.17	4.27	18.23
1960	0.78	0.69	0.77	0	0.99	3.9	10.78	3.58	1.52	4.75	0	1.68	29.44
1961	0.12	0.19	2.37	1.05	0.47	1.78	1.73	4	1.32	1.04	1.58	0.47	16.12
1962	0.41	0.09	0.4	0.45	0.3	3.12	4.8	0.49	1.03	0.36	0.42	0.73	12.6
1963	0.5	1.52	0.02	0	2.52	1.58	2.13	4.9	1.2	0.7	0	0.15	15.22
1964	0.03	1.46	0.17	0.55	0.68	0.28	2.8	1.27	1.02	0	1.55	0.45	10.26
1965	0.13	0.3	0.73	1.2	2.62	1.7	2.2	1.43	1.33	0.35	0	0.51	12.5
1966	0.42	0.54	0	0.08	1.12	1.36	3.54	3.82	0.18	0	0.03	0.03	11.12
1967	0	0.32	0.13	0.29	0.73	0.87	5.96	1.94	2.12	0	0.1	0	12.46
1968	1.17	0.57	1.07	0.52	1.03	0.14	1.87	1.93	0.69	0	0.45	0.14	9.58
1969	0	0.78	0.44	0.82	3.4	2.32	3.42	4.59	2.92	2.01	0.45	0.95	22.1
1970	0.01	0.11	1.04	1.95	0.27	1	2.71	2.8	2.72	1.5	0	0	14.11
1971	0.19	0.66	0.33	0.22	1.5	4.86	3.35	3.72	1.05	1.14	1.52	0.55	19.09
1972	0.11	0.03	0.06	0	0.32	1.23	4.57	5.46	4.56	1.92	1.12	0.16	19.54
1973	0.67	0.42	2.04	1.39	0.69	0.61	4.59	1.03	0.53	0.7	0	0.73	13.4
1974	0.58	0.14	0.12	0.47	0.17	0.34	1.14	2.69	2.5	4	0.25	0.33	12.73
1975	0.46	0.78	0.33	0.83	0.91	0.69	3.48	0.68	1.77	0	0.65	0.14	10.72
1976	0.1	0	0.27	1.49	0.73	2.5	4.51	0.24	1.82	0.87	0.32	0	12.85
1977	0.28	0.33	0.23	3.13	1.04	1.35	1.58	1.91	0.38	0.25	0.39	0.04	10.91
1978	0.62	0.42	0.25	0.68	3.02	3.27	1.37	1.04	0.84	0.25	2.6	0.43	14.79
1979	0.67	0.04	0.58	1.03	3.45	2.39	4.21	2.45	0.81	1.38	0.73	0.12	17.86
1980	0.33	0.82	0.83	2.25	2.33	0.17	0.71	6.3	2.05	0.13	0.93	0.05	16.9
1981	0.1	0.3	0.69	0.8	0.61	2.08	1.05	6.25	1.58	1.52	0.12	0	15.1
1982	0.12	0.23	0.22	0.48	1.46	3.31	3.97	0.9	0.94	1.83	0.79	1.08	15.33
1983	0.7	1.63	0.92	1.15	1.27	2.64	0.58	0.58	0.34	1.8	0.94	0.96	13.51
1984	0.29	0.11	1.34	1.66	2.58	3	1.51	3.95	0.88	3.44	1.07	1.61	21.44
1985	0.21	0.55	3.4	1.31	2.21	2.12	0.91	2.57	2.54	4.71	0.88	0.02	21.43
1986	0.02	0.98	0.19	0.44	2.46	5.34	0.67	2.24	3.09	2.45	3.45	0.79	22.12
1987	1.19	1.45	0.57	0.78	3.63	1.68	0.24	3.16	2.08	0.22	0.39	0.43	15.82
1988	0.12	0	0.4	2.49	2.53	3.73	1.76	1.87	4.53	0.41	0.2	0.49	18.53
1989	0.19	0.34	0.29	0.18	0.85	4.47	2.05	4.81	1.91	0.43	0	0.2	15.72
1990	0.76	1.37	0.6	0.29	1.25	0.07	3.43	2.25	3.7	0.3	1.22	0.25	15.49
1991	0.97	0	1.26	0	2.48	1.87	6.69	4.44	2.99	0.32	1.84	1.79	24.65
1992	0.42	0.52	0.54	0.82	2.27	2.68	2.66	2.82	1.01	0.14	0.33	0.21	14.42
1993	0.68	0.35	0.97	0.68	0.88	3.11	2.19	2.71	0.25	1.94	0.43	0.02	14.21
1994	0.09	0.05	1.48	1.97	5.17	0.84	2.13	2.22	1.35	1.51	0.47	0.4	17.68
1995	0.13	0.01	0.78	0.28	2.63	1.11	2.65	1.23	2.1	0.33	0.01	0.4	11.66
1996	0.21	0.06	0	0	0.45	3.88	8.72	2.44	0.84	1.62	0.52	0.15	18.89
1997	0.35	0.81	0.09	4.89	1.47	3.39	3.25	4.54	1.25	0.64	0.56	2.7	23.94
1998	0.15	0.61	2.59	1.23	0.08	0.14	2.45	4.56	0.61	4.6	0.42	0.21	17.65
1999	1.68	0	1.25	1.84	5.83	1.73	0.55	2.34	1.98	0.65	0.05	0.82	18.72
2000	0.01	0	1.75	0.74	0.85	1.17	2.25	0.26	0.05	3.83	0.43	0.84	12.18
2001	0.67	0.95	3.45	0.1	2.82	1.76	0.67	2.83	0.19	0.15	1.57	0.34	15.5

2002	0.54	0.16	0.32	0.53	0.65	0.67	4.38	0.72	4	1.2	1.49	0.73	15.39
2003	0.01	0.64	1.25	0.69	1.88	3.99	0.53	4.26	0.28	0.9	0	0.27	13.25
Period of Record Statistics													
MEAN	0.37	0.47	0.74	1.1	2.04	1.91	2.63	2.68	1.52	1.28	0.68	0.56	16
S.D.	0.36	0.52	0.83	1.07	1.78	1.41	1.89	1.69	1.23	1.43	0.77	0.7	5.14
SKEW	1.09	1.53	1.66	1.41	1.9	0.81	2.15	0.78	1.42	1.88	1.84	2.53	1.38
MAX	1.68	2.4	3.69	4.89	9.36	6.39	11.19	8.38	7.23	7.51	4	4.27	34.94
MIN	0	0	0	0	0	0	0.24	0.12	0	0	0	0	6.13
NO YRS	98	98	99	99	98	99	99	99	98	97	97	95	

SAN JON

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1914	0.1	0.15	0.1	1.34	5.47	1.61	3.91	2.14	0.5	3.39	0.06	0.99	19.76
1915	0.43	0.82	0.92	4.17	2.42	2.36	3.37	3.65	3.88	1.2	0.02	0.01	23.25
1916	1.61	0	0.31	1.36	0.13	1.13	1.73	6.98	0.68	2.83	0.22	0.61	17.59
1917	0.3	0.03	0.16	0.2	2.14	0.79	1.49	2.23	1.9	0.11	0.19	0.02	9.56
1918	0.19	0.02	0.23	1.11	0.38	1.87	3.35	0.48	1.35	2.86	1.13	1.88	14.85
1919	0.02	0.14	2.87	6.27	4.86	0	0	2.06	4.14	1.61	0	0.29	22.26
1920	0.86	0.07	0.02	0.07	0	3.76	1.05	2.86	1.36	1.13	0	0.29	11.47
1921	0	0.02	0.27	0	0	6.79	6.06	0	0.31	0.33	0	0	13.78
1922	0.11	0.62	1.04	1.81	2.52	1.37	0	0	0	0.18	0.68	0	8.33
1923	0	0.82	0	2.57	0.25	4.77	1.45	0	1.51	0	0	0	11.37
1924	0	0.3	0.87	0.7	0.9	0	2.81	4.23	2.28	1.06	0.75	0.58	14.48
1925	0.22	0	0	0.86	3.21	0	0	2.34	1.37	1.21	0	0.25	9.46
1926	0.1	0	0	0	0	6.48	1.69	3.65	2.46	0.36	0	1.15	15.89
1927	0.15	0	0.14	0.05	0.02	3.69	3.61	3.2	1.88	0	0	0	12.74
1928	0	0.53	0	0.35	3.1	0	1.29	1.56	1.23	1.66	1.62	0.6	11.94
1929	0	0.17	1.66	0	1.51	0.35	2.97	2.28	0.9	0.72	1.05	0	11.61
1930	0.23	0.01	0.45	0	0	2.71	3.02	1.22	0.79	7.54	0.64	0.1	16.71
1931	0	0.41	1.16	0	0	0.66	3.09	4.67	2.32	0.91	0.67	0.4	14.29
1932	0.52	0.29	0.2	1.22	1.97	2.84	5.72	1.82	2.61	0.5	0.04	0.68	18.41
1933	0.05	0.27	0.11	0.24	0.7	0.98	3.36	7.99	0.04	0.21	0.72	0	14.67
1934	0.04	0.28	0.21	0.05	0.46	0.44	0.73	2.33	0.05	1.92	0.72	0.04	7.27
1935	0.11	0	0.32	0	4.42	0.4	2.93	2.79	0.63	0.07	1.26	0	12.93
1936	0.7	0.2	0	0.13	2.86	1.74	2.02	1.04	2.1	0.5	0	0.31	11.6
1937	0.12	0.2	1.24	0.65	5.73	3.6	1.2	0.15	1.87	0.71	0.13	0.74	16.34
1938	0.56	1.06	0.52	0.44	1.27	3.11	2.22	0.02	0.85	1.1	0.04	2.57	13.76
1939	2.06	0.35	0.15	1.13	2.91	0.79	1.44	2.77	0.4	0.55	0.3	1.45	14.3
1940	0.55	0.51	0.91	0.88	2.34	0.13	2.82	1.92	0.3	0.1	3.76	0.27	14.49
1941	0.45	0.18	2.33	1.99	10.17	3.51	1.95	2.46	4.73	6.77	0.02	0.2	34.76
1942	0	0.02	0.54	4.99	0.44	0.84	1.54	4.72	2.02	2.87	0	0.8	18.78
1943	0.03	0	0	0.08	1.35	1.77	1.41	2.33	0.82	0.23	0	2.48	10.5

SAN JON

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1944	0.21	0.4	0.31	1.62	2.04	3.26	4.65	3.81	1.52	0.63	0.29	1.16	19.9
1945	0.57	0.2	0	0.39	0.86	0.77	2.35	3.51	3.46	2.32	0	0.04	14.47
1946	0.19	0.4	0.2	0.16	1.05	1.37	2.91	3.44	2.77	1.82	2.46	0	16.77
1947	0.26	0	0.33	1.31	3.32	0.09	1.69	2.44	0	0.3	0.73	0.87	11.34
1948	0.91	1.27	0.87	0.11	1.97	1.9	1.37	2.77	0	1.12	0.27	0	12.56
1949	1.17	1.08	0.48	1.25	2.41	3.93	3.1	0.09	0.39	0.13	0.18	0.26	14.47
1950	0	0.14	0	0.42	1.71	1.43	6.93	1.83	2.88	0.12	0	0.04	15.5
1951	0.64	0.2	0.69	0.35	4.2	0.61	1.29	0.96	0.06	1.33	0.04	0.19	10.56
1952	0.36	0	0.35	1.13	0.67	0.88	2.31	2.45	0.41	0	0.86	0.13	9.55
1953	0.15	0.24	0.12	0.17	0.51	0.33	4.56	2.11	0	0.48	0.15	0.77	9.59
1954	0.15	0.05	0.06	1.03	1.51	1.48	1.31	1.68	0.34	1.86	0.05	0.03	9.55
1955	0.05	0.09	0.11	2.12	3.13	0.38	2.68	1.08	1.24	0.19	0	0.4	11.47
1956	0.03	1.75	0.01	0	1.19	2.05	2.28	1.96	0.11	0.34	0	0.06	9.78
1957	0.23	0.41	1.77	0.96	2.31	0.64	2.47	2.73	0.06	2.42	0.91	0.04	14.95
1958	0.9	0.29	1.68	1.32	2.08	1.12	3.42	3.21	3.64	0.25	0.1	0.15	18.16
1959	0.23	0.06	0.24	0.23	1.75	3.49	0.79	6.89	0.01	1.3	0	4.08	19.07
1960	0.96	1.1	0.52	0	0.7	5.53	9.65	2.56	4.23	4.07	0.17	1.31	30.8
1961	0.19	0.01	2.17	0.63	0.76	1.7	3.24	3.82	2.76	1.48	1.6	0.54	18.9
1962	0.2	0.2	0.24	0.48	0.86	5.26	6.26	0.46	2.27	0.3	0.36	0.25	17.14
1963	0.04	1.01	0.05	0.09	1.75	1.73	1.73	4.55	1.3	0.38	0.08	0.09	12.8
1964	0.08	1.47	0.11	0.19	1.32	0.23	1.57	1.53	1.71	0.05	1.79	0.37	10.42
1965	0.11	0.46	0.88	1.15	3.64	3.52	2.76	1.89	1	0.91	0	0.65	16.97
1966	0.56	1.06	0	0.09	0.34	1.95	2.65	3.15	2.21	0.03	0.06	0.09	12.19
1967	0	0.47	0.03	0.47	1.08	1.79	6.63	1.62	1.72	0.27	0.22	0.77	15.07
1968	1.36	0.09	0.76	0.99	1.43	2.14	1.74	1.99	0.18	1.07	0.73	0.17	12.65
1969	0	0.6	0.85	1.88	4.69	3.07	3.95	2.32	4.66	2.94	0.4	0.92	26.28
1970	0.17	0.07	1.29	2.71	0.19	0.67	3.69	1.98	2.96	1.99	0.07	0	15.79
1971	0.23	0.55	0.09	0.99	1.6	1.53	1.64	6.27	2.05	1.86	2.03	0.66	19.5
1972	0.07	0.08	0.41	0.03	0.39	1.23	9.06	6.25	4.08	1.91	1.47	0.13	25.11
1973	0.49	0.76	0	1.39	1.47	0.82	3.61	0.22	0.93	0.72	0.07	0.99	11.47
1974	0.39	0.2	0.35	0.11	0.27	0.72	0.95	2.94	3.34	4.55	0.27	0.57	14.66
1975	0.48	1.63	0.3	1.39	1.14	1	2.79	3.2	1.06	0	0.99	0.01	13.99
1976	0.09	0.03	0.36	0.91	0.59	2.93	2.08	1.01	2.13	1.51	0.5	0	12.14
1977	0.51	0.63	0.76	2.51	2.25	2.45	1.23	4.46	0.98	0.08	0.21	0.03	16.1
1978	0.82	0.54	0.18	0.62	3.81	5.09	2.21	0.81	0.82	0.33	0	0.51	15.74
1979	0.86	0.02	0.18	1.04	2.24	3.63	2.03	1.94	0.77	2.21	0.51	0.04	15.47
1980	0.37	0.81	0.71	1.34	2.38	0.19	1.35	1.8	1.93	0.13	1.23	0.06	12.3
1981	0.02	0.17	1.44	1.1	0.73	3.02	2.84	10.61	3.82	1.81	0.85	0.02	26.43
1982	0.11	0.19	0.2	0.83	1.7	3.34	4.27	2.32	1.12	1.65	0.66	1.45	17.84
1983	1.01	1.95	0.96	1.2	1.8	2.16	1.59	1.15	0.47	2.22	0.85	0.49	15.85
1984	0.41	0.04	1.64	1.63	1.79	2.45	1.32	4.22	0.33	3.53	1.14	0.94	19.44

SAN JON													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1985	0.82	0.17	2.63	1.2	2.98	1.98	0.9	2.39	2.51	3.11	0.27	0.09	19.05
1986	0	1.96	0.37	0.56	4.06	2.97	0.95	4.09	3.98	1.79	3.79	0.84	25.36
1987	1.31	1.76	1.15	0.47	4.32	2.74	0.02	5.46	1.1	0.02	0.18	0.78	19.31
1988	0.06	0.05	1.03	2.5	1.37	5.73	3.98	3.99	5.06	0.53	0.2	0.38	24.88
1989	0.3	0.1	0.45	0.4	2.81	2.24	2.35	6.17	1.23	0.43	0	0.32	16.8
1990	1.75	1.98	0.7	0.47	0.51	0.15	1.82	1.2	3.51	0.17	0.98	0.14	13.38
1991	1.31	0	2.44	0	4.77	2.43	7.62	5.64	2.66	0.59	1.9	1.11	30.47
1992	0.67	0.35	0.15	0.26	2.82	4.18	3.87	3.86	1.25	0.13	0.96	0.64	19.14
1993	0.85	0.54	1.02	0.5	0.77	3.41	2.62	1.96	0.45	1.43	0.43	0	13.98
1994	0.3	0.05	1.64	2.15	5.61	1.9	3.19	2.15	0.19	1.11	0.41	0.51	19.21
1995	0.46	0.14	1.35	0.34	2.63	0.69	1.36	2.46	1.72	0.18	0.04	0.91	12.28
1996	0.42	0.21	0.02	0	0.44	4.16	6.23	4.77	1.15	1.67	0.48	0.51	20.06
1997	0.53	0.64	0	5.77	1.01	2.65	2.16	3.08	1.67	1.79	1.01	2.63	22.94
1998	0.04	0.85	2.3	1.01	0	0.13	3.35	3.31	0.67	4.89	1.29	0.29	18.13
1999	2.39	0	1.37	3.34	3.01	0.96	1.98	2.73	3.19	0.36	0.07	1.26	20.66
2000	0	0	1.76	0.56	0.15	2.98	4.88	1.04	0	4.74	0.84	0.92	17.87
2001	1.19	0.91	2.32	0.1	2.36	2.19	0.89	2.05	0.19	0	1.79	0.34	14.33
2002	0.81	0.27	0.65	0.36	0.72	1.88	1.18	1.7	2.08	1.11	0.97	1.11	12.84
2003	0	0.3	1.29	0.14	0.6	2.44	0.75	1.78	0.62	1.28	0.75	0	9.95
Period of Record Statistics													
MEAN	0.44	0.43	0.71	1.02	2.02	2.16	2.8	2.85	1.65	1.33	0.63	0.57	16.84
S.D.	0.49	0.51	0.72	1.21	1.68	1.54	1.84	1.84	1.31	1.47	0.76	0.69	5.39
SKEW	1.69	1.58	1.18	2.34	1.75	0.86	1.57	1.42	0.73	1.92	2.08	2.41	0.99
MAX	2.39	1.98	2.87	6.27	10.17	6.79	9.65	10.61	5.06	7.54	3.79	4.08	34.76
MIN	0	0	0	0	0	0.09	0.02	0.02	0	0	0	0	7.27
NO YRS	87	89	86	87	85	86	87	87	87	88	83	85	

RAGLAND 3 SSW													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1935	0	0	0.39	0	4.22	1.05	1.93	4.83	2.38	0.35	1.4	0.07	16.62
1936	1.36	0.14	0	0.08	2.48	0.8	0	2.78	5.8	0.29	0	0.47	14.2
1937	0.06	0.37	1.05	0.58	9.35	2.87	1.17	0.69	3.78	0.59	0.07	0.73	21.31
1938	0.89	1.71	0.32	0.46	1.01	2.17	5.44	1.2	3.39	1.98	0.28	0.35	19.2
1939	1.27	1.02	0.81	1.31	1.63	1.33	3.59	2.09	0.41	0.67	0.23	0.97	15.33
1940	0.39	0.76	0.82	1.04	2.29	0.64	0.51	1.98	1.66	0.31	2.58	0.33	13.31
1941	0.56	0.28	2.29	3.35	9.19	5.04	3.08	2.31	6.66	7.12	0	0.43	40.31
1942	0.07	0.52	0.18	4.69	0.55	2.26	0.78	6.5	1.36	3.5	0	1.05	21.46
1943	0	0	0.26	0	1.27	5.89	1.57	1.34	1.24	0.1	0.3	2	13.97
1944	0.4	0.33	0.1	0.88	1.3	3.98	1.98	3.38	2.04	1.84	0.58	1.53	18.34
1945	1.09	0.12	0.26	0.48	1.69	0	3.49	3.49	2.11	1.09	0	0.11	13.93

RAGLAND 3 SSW													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1946	0	0	0	0.08	0.88	0.46	1.32	3.85	5.5	1.48	0.89	0.06	14.52
1947	0.17	0	0.55	2.17	2.64	0	0	0	0	0	1.08	0.9	7.51
1948	1.23	1.09	0.91	0.2	2.28	0.85	1.12	1.25	0	3.31	1.8	0	9.42
1949	1.85	0.9	0.6	2.3	4.17	5.18	9.42	0	1.23	0.22	0	0	24.64
1950	0	0.04	0	0.06	0.4	2.44	6.95	1.55	3.56	0	0	0	15
1951	0.47	0.48	0.64	0	2.84	1.29	3.79	1.73	0.12	0.93	0.56	0	12.85
1952	0.28	0.36	0.18	0.69	0.03	0.52	3.59	3.25	0.94	0	1.11	0.23	11.18
1953	0.48	0.25	0.2	0.33	3.25	0.31	4.26	1.16	0	0.95	1	0.6	12.79
1954	0.08	0.27	0	0.75	3.57	0.81	3	2.67	0.79	3.38	0.3	0	15.62
1955	0.15	0	0	1.19	1.72	0.69	3.31	1.9	2.6	0.41	0	0.11	12.08
1956	0	0.53	0	0.17	0.97	2.24	3.48	2.82	0	0.63	0.27	0	11.11
1957	0.05	0.49	1.04	0.8	2.67	0.96	3.52	2.04	0.4	3.37	0.86	0.37	16.57
1958	1.18	0.15	2.23	1.67	0.47	0.81	4.6	4.05	2.55	0.84	0.31	0.36	19.22
1959	0.15	0.08	0	0	2.84	2.62	3.79	6.52	0.09	1.39	0.11	2.47	20.06
1960	1.2	1.65	0.47	0	0.94	5.41	11.39	8.16	3.28	5.75	0	1.77	40.02
1961	0.26	0.33	1.46	0.81	0.52	3.06	5.78	4.57	3.13	0.95	1.43	0.73	23.03
1962	0.35	0.31	0.7	0.64	0.76	2.22	2.85	0.62	2.39	0.12	0.94	0.89	12.79
1963	0.32	1.36	0	0.3	3.38	3.28	0.95	3.17	0	1.05	0.37	0.08	14.26
1964	0.02	1.6	0.35	0.05	0.58	0.93	0.94	0.21	2.39	0.02	1.98	0.46	9.53
1965	0	0.81	0.95	1.61	3.89	1.96	2.39	2.6	1.13	0	0	0.69	16.03
1966	0.4	0.73	0	0.31	0.73	1.93	2.52	6.22	0.63	0	0.11	0.05	13.63
1967	0	0.18	0.3	0.09	2.23	1.22	3.58	2.34	0.62	0.25	0.25	0.85	11.91
1968	1.28	0.42	1.92	1.03	0.89	1.39	1.96	0.9	0	1.37	0.51	0.12	11.79
1969	0	0.83	1.03	0.69	4.52	3.02	1.62	5.69	3.42	2.58	0.5	1.48	25.38
1970	0.04	0.01	0.79	2.66	0	1.16	3.63	3.26	4.29	0.89	0.06	0	16.79
1971	0.32	0.69	0.28	0.34	1.3	1.73	2.81	2.98	2.2	1.67	1.2	0.69	16.21
1972	0.03	0.09	0.05	0	1.53	2.16	6.93	5.21	4.37	2.19	0.65	0.1	23.31
1973	0.88	0.63	2.18	1.77	0.6	0.97	5.77	1.61	0.6	0.95	0.15	1.08	17.19
1974	0.34	0.91	0.08	0.02	0.2	0.34	1.42	2.39	3.8	4.3	0.37	0.44	14.61
1975	0.41	1.18	0.42	0.92	0.44	0.17	5.66	1.43	1.69	0	0.72	0.05	13.09
1976	0.05	0.08	0.28	0.74	1.07	0.56	3.63	2.42	5.07	0.78	0.35	0	15.03
1977	0.2	0.76	0.66	2.37	2.09	1.19	3	3.79	1.42	0.4	0.39	0.01	16.28
1978	0.81	0.82	0.37	0.67	2.08	3.63	1.64	1.85	1.63	0.71	3.25	0.4	17.86
1979	1.02	0.2	0.39	2.42	2.01	3.14	3.57	3.64	1.94	1.1	0.7	0.17	20.3
1980	0.2	0.72	0.77	1.72	2.99	0.01	0.31	1.61	4.21	0.05	1.17	0.3	14.06
1981	0.21	0.1	1.08	0.63	0.57	3.12	3.5	7.69	3.27	2.02	0.27	0	22.46
1982	0.19	0.36	0.37	0.16	1.28	2.76	4.24	1.09	1.84	2.25	0.87	1.46	16.87
1983	1.78	0.93	1.24	1.26	0.92	1.41	0.53	1.2	0.21	2.17	0.74	0.97	13.36
1984	0.3	0.33	0.85	0	0	0	0	3.02	0.87	4.1	1.37	0.63	11.47
1985	0.53	0.31	3.85	1.05	1.67	2.39	0.63	3.38	3.39	2.28	0.97	0.07	20.52
1986	0	1.51	0.06	0.48	4.51	3.88	0.24	4.52	4.85	2.73	3.55	1.15	27.48

RAGLAND 3 SSW													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1987	0.67	1.6	0.62	0.26	2.74	3.31	0.6	3.79	1.73	0.37	0.27	0.92	16.88
1988	0	0.1	0.15	2.2	2.95	9.07	4.09	5.89	2.84	0.28	0.22	0.31	28.1
1989	0.14	0.54	0.15	0.2	1.34	4.05	1	4.78	1.6	0.25	0	0.29	14.34
1990	1.27	1.83	0.34	0.9	0.38	0	4.72	1.74	5.36	0	1.09	0	17.63
1991	0.81	0	0.81	0	3.98	0.25	9.64	5.65	3.09	0.22	1.64	2.45	28.54
1992	0.98	0.34	0.17	0.95	1.74	2.23	2.33	3.08	0.82	0.24	0.27	0.66	13.81
1993	0.94	0.35	0.74	0.2	1.33	3.51	5.44	2.2	1.53	1.69	0.52	0.15	18.6
1994	0.11	0	1.55	1.39	3.08	0.43	2.19	2.87	0.2	1.29	0.46	0.8	11.29
1995	0.34	0.5	1.1	0.2	3.5	2.3	0.1	1.8	2.3	1	0	0.6	13.74
1996	0.2	0.2	0	0	0.1	5.07	2.38	5.26	2.41	1.95	0.37	0.1	18.04
1997	0.45	0.88	0	4.8	1.3	3.1	4.57	4.03	2.4	0.66	0.93	2.23	25.35
1998	0.1	0.51	1.74	1.28	0.05	0.32	3.66	2.18	0.7	0	0.3	0.28	11.12
1999	1.4	0	1.23	2.73	3.68	0.75	4.1	2.66	1.63	0.25	0.1	1.23	19.76
2000	0	0	1.99	0.38	0.31	3.75	2.98	0.4	0.15	4.02	1	0.63	15.61
2001	1.08	0.7	1.6	0.08	0.85	1	0.57	3.48	0.15	0	1.75	0.26	11.52
2002	0.51	0	0.65	0.5	0.22	0.62	2.55	1.15	4.75	1.3	0.5	0.74	13.49
2003	0	0.99	0.91	0	1.2	3.63	0.05	3.22	0.71	2.54	0.65	0	13.9
Period of Record Statistics													
MEAN	0.47	0.53	0.71	0.94	1.95	2.11	3.15	3.03	2.18	1.35	0.68	0.59	17.75
S.D.	0.49	0.49	0.73	1.05	1.81	1.72	2.29	1.77	1.67	1.46	0.74	0.62	6.18
SKEW	1.05	0.98	1.75	1.79	2.07	1.31	1.28	0.84	0.63	1.7	1.87	1.39	1.86
MAX	1.85	1.83	3.85	4.8	9.35	9.07	11.39	8.16	6.66	7.12	3.55	2.47	40.31
MIN	0	0	0	0	0	0	0.05	0.21	0	0	0	0	9.53
NO YRS	66	68	66	66	66	67	66	67	65	66	68	67	

Appendix M – 40 Year Water Plan Resolutions

Guide Resolution

VILLAGE OF LOGAN
RESOLUTION NO. 392

WHEREAS, Quay County is part of the Northeastern New Mexico Planning Region which is one of 16 planning regions in New Mexico that are in the process of developing a regional water plan;

WHEREAS, the purpose of regional water planning is to protect New Mexico water resources and to ensure that each region is prepared to meet future demands; and

WHEREAS, the local governmental entities within Quay County joined together to form the Quay Working Group which has decided to develop a Quay County Water Plan as an important component of the Northeaster Regional Water Plan, and

WHEREAS, the Quay County 40 year water plan serves as a guideline for regional water planning in Quay County and addresses the following items:

1. The region's available water supply
2. The region's water demands
3. The steps the region may undertake to meet future demands with the available supply
4. Alternatives for meeting future demands

WHEREAS, the Village council has the authority to plan water development plans for periods not to exceed 40 years from statute Section 72-1-9 NMSA, 1978, and

WHEREAS, the Village of Logan desires to build flexibility into the document and have the ability to continually address changing conditions that occur in the community, by adopting the plan by Resolution, and

WHEREAS, that the Village of Logan will use the Quay County 40 Year Water Plan, as a guide for decisions concerning the Village's development, growth, funding opportunities and strategies to address the issues impacting Logan; and as a reference for the private section in making informed decisions about the Village. The following principles shall help to guide the community decision-making.

1. Policy decisions shall be based on the short and long term recommendations of this Plan as they relate to water use, economic development, housing, transportation, infrastructure, intergovernmental cooperation and recreation;

2. Planning efforts shall be coordinated between various levels of government, other governmental entities, nonprofit organizations, and the private section, wherever appropriate;

3. The Plan will be integrated with other ongoing planning activities;

4. The Plan is not the final step in good community water planning, other steps will follow:

5. It is not a static document, as the community changes, so should the plan;

and

6. Citizens participation will remain an integral part of the of the Comprehensive Plan's implementation and amendment process.

NOW THEREFORE, BE IT RESOLVED THAT THE QUAY COUNTY 40 YEAR WATER PLAN BE ADOPTED BY THE VILLAGE OF LOGAN COUNCIL.

Approved and accepted this 13th day of July, 2004.

Signed
Zaida Babb
Mayor

ATTEST:

Signed
Angelina Cordova-Jackson
Clerk/Treasurer

Scanned Copy of Signed Resolution By Village of Logan

VILLAGE OF LOGAN
RESOLUTION NO. 392

WHEREAS, Quay County is part of the Northeastern New Mexico Planning Region which is one of 16 planning regions in New Mexico that are in the process of developing a regional water plan;

WHEREAS, the purpose of regional water planning is to protect New Mexico water resources and to ensure that each region is prepared to meet future demands; and

WHEREAS, the local governmental entities within Quay County joined together to form the Quay Working Group which has decided to develop a Quay County Water Plan as an important component of the Northeaster Regional Water Plan, and

WHEREAS, the Quay County 40 year water plan serves as a guideline for regional water planning in Quay County and addresses the following items:

1. The region's available water supply
2. The region's water demands
3. The steps the region may undertake to meet future demands with the available supply
4. Alternatives for meeting future demands

WHEREAS, the Village council has the authority to plan water development plans for periods not to exceed 40 years from statute Section 72-1-9 NMSA, 1978, and

WHEREAS, the Village of Logan desires to build flexibility into the document and have the ability to continually address changing conditions that occur in the community, by adopting the plan by Resolution, and

WHEREAS, that the Village of Logan will use the Quay County 40 Year Water Plan, as a guide for decisions concerning the Village's development, growth, funding opportunities and strategies to address the issues impacting Logan; and as a reference for the private section in making informed decisions about the Village. The following principles shall help to guide the community decision-making.

1. Policy decisions shall be based on the short and long term recommendations of this Plan as they relate to water use, economic development, housing, transportation, infrastructure, intergovernmental cooperation and recreation;
2. Planning efforts shall be coordinated between various levels of government, other governmental entities, nonprofit organizations, and the private section, wherever appropriate;
3. The Plan will be integrated with other ongoing planning activities;
4. The Plan is not the final step in good community water planning, other steps will follow:
5. It is not a static document, as the community changes, so should the plan and

6. Citizens participation will remain an integral part of the of the Comprehensive Plan's implementation and amendment process.

NOW THEREFORE, BE IT RESOLVED THAT THE QUAY COUNTY 40 YEAR WATER PLAN BE ADOPTED BY THE VILLAGE OF LOGAN COUNCIL.

Approved and accepted this 13th day of July, 2004.

Zaida Babb
Mayor

ATTEST:

Angelina Cordova-Jackson
Clerk/Treasurer

Scanned Copy of Signed Resolution by City of Tucumcari

RESOLUTION 2004-30

WHEREAS, Quay County is part of the Northeastern New Mexico Planning Region which is one of 16 planning regions in New Mexico that are in the process of developing a regional water plan; and

WHEREAS, the purpose of regional water planning is to protect New Mexico water resources and to ensure that each region is prepared to meet future demands; and

WHEREAS, the local governmental entities within Quay County joined together to form the Quay Working Group which has decided to develop a Quay County Water Plan as an important component of the Northeastern Regional Water Plan; and

WHEREAS, the Quay County 40 year water plan serves as a guideline for regional water planning in Quay County and addresses the following items:

1. The regions available water supply
2. The regions water demands
3. The steps the region may undertake to meet future demands with the available supply
4. Alternatives for meeting future demands

WHEREAS, the City Commission has the authority to plan water development for periods not to exceed 40 years in accordance with Section 72-1-9 NMSA, 1978; and

WHEREAS, the City of Tucumcari desires to build flexibility into the document and have the ability to continually address changing conditions that occur in the community, by adopting the plan by Resolution; and

WHEREAS, the City of Tucumcari will use the Quay County 40 Year Water Plan, as a guide for decisions concerning the City's development, growth, funding opportunities and strategies to address the issues impacting Tucumcari; and as a reference for the private section in making informed decisions about the City. The following principles shall help to guide the community decision making.

1. Policy decisions shall be based on the short and long term recommendations of this Plan as they relate to water use, economic development, housing, transportation, infrastructure, intergovernmental cooperation and recreation;
2. Planning efforts shall be coordinated between various levels of government, other governmental entities, nonprofit organizations, and the private section, wherever appropriate;
3. The Plan will be integrated with other ongoing planning activities;
4. The Plan is not the final step in good community water planning, other steps will follow;
5. It is not a static document, as the community changes, so should the plan; and
6. Citizen's participation will remain an integral part of the Comprehensive Plans implementation and amendment process.

NOW THEREFORE, BE IT RESOLVED, that the Quay County 40 Year Water Plan be and is hereby adopted by the City Commission of the City of Tucumcari.

PASSED, ADOPTED AND APPROVED this 26th day of August, 2004.

Mary Mayfield, Mayor

Attest:

Rachel Hicklin, City Clerk