WATER CONSERVATION PLAN

BERNALILLO COUNTY, NEW MEXICO

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Bernalillo County Water Resources Program

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EXECUTIVE SUMMARY

In order to promote efficient and responsible use of a valuable resource, Bernalillo County undertook development of a Water Conservation Plan (Plan) for unincorporated Bernalillo County. Bernalillo County recognizes the urgent need for water conservation, given the current drought, a limited water supply and a growing region. The purpose of the Water Conservation Plan is to reduce water use in the County among residents, utilities, businesses, industry, institutional users and agricultural users. Water conservation is the most economical means of extending our water supply.

Bernalillo County solicited public input before and after the Plan was developed through two series of public meetings held throughout the County. The public input was used to develop direction for the Plan. Public concerns in the first series of meetings included the amount of new development, concern about how conserved water would be used, and opposition to mandatory metering of domestic wells. A primary concern among agricultural users was that the County recognize agriculture's role in recharging the aquifer. In every meeting, the public emphasized that Bernalillo County should set a high standard for itself in water conservation at County facilities and in County operations.

Components of the Plan include a current water usage report, a communications plan, a review of mandatory and voluntary measures from conservation programs in New Mexico and around the country, and a review of the Water Conservation Plan for Bernalillo County facilities. From these components, recommendations for the development and implementation of a conservation program were established. These recommendations were then evaluated by the County and the public and ranked according to priority.

The water usage portion of the Plan evaluated current water use in seven planning areas of unincorporated Bernalillo County. Each of the study areas was evaluated to obtain data such as population, average household size, number of residents using utilities, number of residents estimated to use domestic wells and estimated gallons per capita of water used daily (GPCD). Overall in unincorporated Bernalillo County, the Plan estimates that 37 percent of the population uses domestic wells, 40 percent are served by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), 15 percent are supplied by three other major utilities (serving 1,000 or more connections), and the remaining residents are served by smaller utilities.

Currently, Bernalillo County residents rely solely on ground water for their drinking water, while agriculture in the area utilizes surface water. The impact of agriculture on the aquifer was evaluated in unincorporated Bernalillo County, based on existing studies. The water use data helped to identify approaches to each of the planning areas, as well as data limitations and data gaps to pursue in the future.

Water conservation measures from conservation programs in New Mexico and around the country were reviewed for implementation in unincorporated Bernalillo County. A list of potential conservation measures was developed and reviewed by the project team. The measures were ranked according to ease of implementation and value to the Water Conservation Program. The values guiding the prioritization process included the following: effectiveness in reducing residential water use, effectiveness in reducing volume of water used by utilities, effectiveness in reducing volume of water used by domestic well users, increasing water conservation knowledge and understanding, broad and equitable participation, political will/public support, and synergy with other water management agencies in the region.

All the recommendations were then provided to the public at a second series of meetings. Participants at these later meetings generally supported recommendations that applied to new development, reflecting the concern about new development expressed in the first round of meetings. Some of the mandatory measures that were supported include time of day restrictions for irrigation, irrigation system standards for existing golf courses, athletic fields, golf courses and new development, design regulations and water

budgets for County and private golf courses, and for all County-owned parks and athletic fields. The meeting participants also demonstrated support for requiring low water use landscaping for new developments. Other measures that the public supported included requiring a zero footprint for new development (requires new development to offset their water demand on existing supplies) and establishing a voluntary tiered system for water smart homes. Attendees expressed support for incentive programs, including toilet replacement, irrigation controllers, cisterns and gray water systems.

Public meeting participants opposed required retrofit to low-flow fixtures on resale or remodel and implementation of ABCWUA ordinances. Requiring a well meter after four water waste violations was not supported. Meeting participants supported more stringent water conservation requirements for homes over 3,000 square feet, but not for those over 2,500 square feet. Meeting participants opposed conversion to low-flow devices by a certain date for existing businesses, promoting gray water systems through mandatory measures, and implementation of limitations on high water use landscaping.

The resulting high priority measures were used to develop an outline for implementation of a Water Conservation Program. Implementation of the Plan requires three components: (1) education and outreach, (2) voluntary measures and incentives, and (3) mandatory measures. The County Water Conservation Program will include a combination of all three, beginning with education and outreach, followed by voluntary measures, and then mandatory measures.

To implement the Plan, the County must designate or hire staff to carry out the Water Conservation Program and the related implementation of Water Conservation for County Facilities. The first task is to develop and implement the educational and outreach program. Other steps in implementation include the following: develop and implement an incentives program; review relevant water conservation ordinances, including those adopted by the ABCWUA, adapt as necessary, and present for adoption by the Bernalillo County Commission; continue to evaluate water use patterns; and close data gaps. Annual tasks for the Water Conservation Program include reviewing reduction goals and gathering data to evaluate water use compared with baseline data.

The Water Conservation Plan outlines an approach to assess the effectiveness of a Water Conservation Program. Implementation of successful conservation measures will be assessed by assessing reduction in water use, conducting surveys and public meetings, and determining the extent of acceptance of education and incentive measures. The results will be compared with baseline data from the water use study and future data collection efforts.

Overall, the Water Conservation Plan recommends many measures that would be implemented through a Bernalillo County Water Conservation Program. The measures can be implemented over time as necessity requires and available resources permit. However, for water conservation to be effective, Bernalillo County must fund this program on an on-going basis.

BERNALILLO COUNTY WATER CONSERVATION PLAN

1. INTRODUCTION

This document presents the Bernalillo County Water Conservation Plan. As an input to the Plan, Bernalillo County (the County) conducted a study of water usage in the County to better understand the dynamics of reaching County water use goals. As additional inputs to the Plan, the County reviewed mandatory and voluntary measures in other parts of the state and country, and had the Bernalillo County Water Conservation Communications Plan (Communications Plan) developed (see Appendix C for the entire Communications Plan).

1.1 PURPOSE OF THE PLAN

Bernalillo County has developed a Water Conservation Plan in order to be good stewards of a scarce resource, and thus a limiting factor for the County. Bernalillo County is in the middle of a rapidly growing region, and in order to maintain quality of life and economic activity, a sustainable water supply will be needed, for which planning and a change in use patterns (behavior) is required. The urgency of the need for conserving water is clear - New Mexico is in the midst of a probable long-term drought and water is over-allocated in the Middle Rio Grande region and state-wide. The bulk of water in unincorporated Bernalillo County is supplied by ground water, a non-renewable resource. The surface water that is used, the supply of which fluctuates according to the weather, is used for agriculture and outdoor use. Some County residents (Albuquerque Bernalillo County Water Utility Authority [ABCWUA] customers only) will likely be supplied by surface water in the future through the ABCWUA San Juan Chama water.

Water conservation is the cheapest way to prolong and help preserve affordable water for generations to come. To be good stewards and lengthen the period of years that water is available, the County should conserve water in its facilities, model conservative use of water, work closely with all residents, businesses, and water suppliers in unincorporated and incorporated parts of the County to promote conservation, and work with other governmental jurisdictions in the region to effectively manage water resources. In addition, the County should take a broad perspective on conservation by incorporating cumulative impacts, land use planning, and comprehensive plans into water resource management. Bernalillo County can convey the benefits of water conservation to utilities by reducing the need for increased water supply and/or water rights, decreasing operation and maintenance costs, and deferring or eliminating new facilities. Benefits to residents and businesses include decreased energy, water, and wastewater bills and decreased landscaping maintenance costs.

To this end, Bernalillo County set the following initial goals for the Water Conservation Plan and its implementation:

- Evaluate current water usage
- Evaluate mandatory, voluntary, and other conservation measures for Water Conservation Plan
- Determine resource levels for water conservation program
- Determine sources of funding for water conservation program
- Develop priorities
- Set measurement goals and criteria
- Improve baseline information on County water usage and update annually
- Gather information on domestic well permits and domestic well usage on an ongoing basis
- Gradually develop appropriate ordinance(s) from the Water Conservation Plan

1.2 CONTEXT OF THE PLAN

The County has unincorporated and incorporated areas, which include the City of Albuquerque with 484,286 residents, the unincorporated County, Los Ranchos de Albuquerque, a village of 5,495 residents, and Tijeras, a village of 467 residents. This Plan covers the unincorporated portions of the County and Los Ranchos de Albuquerque pursuant to its request. Employment in Bernalillo County (including the incorporated area of Albuquerque) is 31 percent services, followed by 21 percent Federal, with only 0.72 percent employed in the agricultural sector. The entire County is 66 percent single family homes, 27 percent multi-family homes, and 7 percent mobile homes. (MRCOG - 2000 Census information)

The ABCWUA serves Bernalillo County and the City of Albuquerque. The ABCWUA was created by the New Mexico State Legislature in 2003 and includes all water and waste water system infrastructure assets that previously were controlled by the City of Albuquerque. The ABCWUA is governed by a board composed of City Councilors, the Mayor, and County Commissioners and is staffed by City of Albuquerque/ABCWUA employees.

Four large utilities serve 55 percent of the population in the unincorporated portions of the County: ABCWUA, New Mexico Utilities, Sandia Peak Utility (SPU), and the Entranosa Water and Wastewater Association (Entranosa). Eight percent of the population is served by 41 smaller utilities or systems, and the remaining 37 percent are estimated to use domestic wells (with a very small population served or supplemented by water haulers in the East Mountains). Appendix A includes a map of the utility boundaries. ABCWUA has a major conservation program. SPU has a conservation program in place. Entranosa provides regular education on conservation in its customer newsletters.

As part of its water conservation planning process, the County is coordinating with the other entities in the region, primarily the ABCWUA, the Mid Region Council of Governments (MRCOG) Water Resources Board (WRB), [1] other counties, and the major and smaller utilities in the County. Economic incentives, policy making, and mandatory measures should be coordinated with the ABCWUA and other entities where possible. Given that Bernalillo County is developing a program for the County, they can take a leadership role with other counties in the region.

As signatories to the Middle Rio Grande Regional Water Plan (MRGRWP), created as part of a process mandated by the state, the County agreed to implement measures from the MRGWRP. Through the planning process, a large number of prominent hydrologists and other experts in the Middle Rio Grande region developed a water budget for the region (which includes Torrance, Bernalillo, Sandoval, and Valencia Counties, and the municipalities contained therein) and concluded that the region is overspending its water budget by approximately 55,000 acre feet per year beyond the renewable amount. (MRGRWP, 2003). In approving the MRGWRP submitted to the Interstate Stream Commission, the Bernalillo County Commission agreed to the following MRGRWP goals that relate to water conservation:

- Conserve water
- Balance growth with renewable supply
- Preserve water for the region's agricultural, cultural, and historical values
- Preserve water for economic and urban vitality
- Measure ALL water uses
- Upgrade agricultural conveyance systems
- Convert to low water use plants

[1] WRB is made up of Bernalillo, Sandoval, Torrance, and Valencia Counties and the municipalities contained therein.

- Implement education programs, and rainwater harvesting
- Convert to low-flow appliances
- Level all irrigated fields
- Convert to xeriscape (MRGRWP, 2003)

1.3 STUDY AREAS

Bernalillo County commissioned a study on current water use, which divided the unincorporated areas into seven study areas to facilitate a targeted approach based on demographics, water use patterns, and geographic and other factors that might impact conservation. A map with all of the study areas can be found in Appendix A. Appendix B contains maps for each of the individual study areas. Mandatory and voluntary measures from successful conservation programs in New Mexico (Albuquerque/ABCWUA, City and County of Santa Fe) and across the country (Texas, Arizona, and California) were reviewed for lessons learned, best management practices, and applicability to the County. Based on all that was learned, a Communications Plan was devised (summarized herein, contained in its entirety in Appendix D), as well as focused outreach for each of the study areas. In addition, a method to measure the effectiveness of the Water Conservation Plan was developed. Finally, the recommendations were prioritized according to value (benefit) and ease of implementation and steps for implementing the Water Conservation Plan were outlined. The overall strategy and approach for a Water Conservation Plan are described below.

The seven study areas shown on Figure 1 are Paradise Hills, North Albuquerque Acres (NAA)/Sandia Heights, North area of the East Mountains, South area of the East Mountains (dividing line is TAZ boundary South of I-40), North Valley, South Valley, and South West Mesa. The City of Albuquerque was excluded and served as the boundary for the study areas. For comparison purposes, the average household income for all of Bernalillo County in 1999 was $38,788 (US Census Bureau). The study areas are profiled in the following sections.

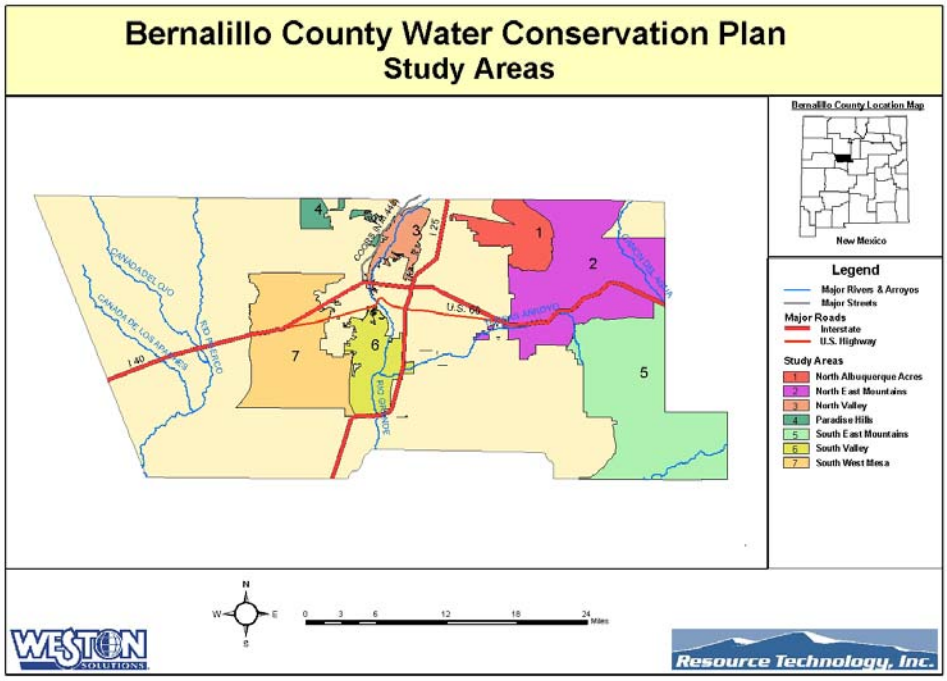


Figure 1. Map of Study areas: (1) NAA/Sandia Heights; (2) North area of the East Mountains; (3) North Valley; (4) Paradise Hills (5) South area of the East Mountains (6) South Valley (7) South West Mesa

1.3.1 Paradise Hills

This area was the earliest urbanized area outside the Albuquerque metropolitan area, now surrounded by the City of Albuquerque. This area is located between Albuquerque and the City of Rio Rancho, with the community of Corrales located to the northeast. Paradise Hills is in the Northwest corner of the County. (See Appendix B for map.) Homes are in the 35 to 40 year old range, and landscaping reflects an earlier era in which water conservation was not a priority, although some homes have converted to xeriscape. The average home sale price is $158,927. Average household size is 2.6 persons. Household income levels range from $42,000 to $130,000 per year. Homes are typically in subdivisions. Multi-family units[2] in this area make up about 20 percent of the residential area.

A majority of homes and businesses in Paradise Hills are served by New Mexico Utilities. Sixty percent of the Utility's water is delivered to its 5,787 residential customers. The remainder is directed to community centers, soccer parks, a golf course (roughly 8 percent of the water), shopping, and services. (NM Utilities, 2005)

1.3.2 North Albuquerque Acres/Sandia Heights

NAA/Sandia Heights is located in the foothills region of the County, west of the Sandia Mountains, in the Northeast corner of the County. In the entire NAA/SH area it is estimated that 34 percent of the residents use wells. The study area includes some scattered retail and little or no industry. The average home price is $420,000. Household income ranges from $54,000 to $130,000. Population in the area is approximately 9,405. The average household size is 2.5 persons. About 8 percent of the residences in this sector are multi-family units. The two neighborhoods are briefly described in the paragraphs below.

Sandia Heights has primarily older homes, which are, for the most part, pueblo-style with native landscaping. Some subdivision covenants in this part of the study area require climate-adapted landscaping, and one subdivision has rather lush lawns. SPU serves most of the residents in Sandia Heights (94 percent), four other smaller utilities serve only 3 percent, and ABCWUA provides water to 1 percent. The average residential gallons per capita per day (GPCD) for SPU customers is 131. Because one subdivision requires lawns, it drives the average GPCD number higher for the entire subdivision.

Almost all NAA residents use domestic wells as their water source. Ornamental water features such as small ponds and fountains are not uncommon in the NAA study area. Most homes in NAA (60 to 70 percent) are newer, with big lots. There are some NAA subdivisions with covenants requires the use of deciduous trees, shrubs, and bluegrass in their yards.

1.3.3 East Mountains - North

The North Section of the East Mountains has a southern boundary just south of I-40 (the boundary is based on MRCOG demographic data). This area has a population of 13,050 (73 percent of total for East Mountains). The total number of households is 5,191. Average household size for the North East Mountains is 2.5 persons. Fifty seven percent of the population is served by a utility. The remainder of the population is assumed to be on domestic wells, with a small percentage using water haulers, most likely to supplement their water supply. Most businesses are located along the corridors of NM 14, or old U.S. 66. Businesses are primarily restaurants, convenience stores, and retail. The cement plant in Tijeras Canyon (unincorporated Bernalillo County) employs about 100 persons, but no other significant industrial sites are in the study area. San Antonio, Sandia Park, Sedillo, and Carnuel are small communities found

[2] The definition of multi-family units means a residential account with multiple dwellings. Utilities differ in their definition of a multi-family unit, some starting at three units, some at six units or greater.

in this study area. The proportion of multi-family units is 16 percent, as compared to the County average of 27 percent. The density is 0.3 people per acre. This portion of the East Mountains is wealthier than the Southern section, as 96 percent of the population has income weighted in the upper three quintiles of income, ranging from approximately $33,000 to $130,000. Average household size is 2.5. The village of Tijeras is incorporated, and is not included in the study area.

The utility serving the largest number of customers in the area is Entranosa with 4,623 customers. In addition, the area is served by 11 other small water utilities with a combined total of 2,899 customers. See Current Water Usage Report (Water Usage Report) in Appendix D for a list of those utilities.

1.3.4 East Mountains - South

The South Section of the East Mountains has a population of 4,854 (27 percent of total for East Mountains). The total number of households is 1,863. Average household size for the South East Mountains is 2.6 persons. Seventy nine percent of the population is estimated to use domestic wells as their primary water source. The remaining portion obtains water from one of five small utilities. The South East Mountain study area contains small communities such as Chilili, Juan Tomas, Escobosa, Ponderosa Pine, and Cedro. Lots in this area tend to be smaller than those found in the North Section of the East Mountains. Most business are located along the corridors of Highway 337 (formerly Route 14), or old U.S. 66. Businesses are primarily restaurants, convenience stores and retail. This study area contains no multi-family units. The density is 0.09 people per acre. This portion of the East Mountains is relatively less wealthy than the Northern section of the East Mountains, as 92 percent of the population have income weighted in the lower three quintiles of income, approximately $14,000 to $42,000.

1.3.4.1 East Mountains (combined)

The following information applies to the North and South Sections of the East Mountains. A majority of residents commute to Albuquerque daily for jobs and shopping. In 1990, the mix of conventional single-family homes versus mobile homes was 80 to 20 percent. About 90 percent of the homes are owned and 10 percent rented.

Some residents rely on or supplement their water supply by paying water haulers to deliver water to their property; however, there is no accurate head count of residents who rely on hauled water. A growing number of residents require supplemental water to augment their poorly producing wells. Many East Mountain residents have experienced dropping well levels, some as much as a couple of hundred feet and some running dry, requiring residents to drill new wells.

1.3.5 North Valley

The North Valley study area has a population of about 20,000 residents living in about 8,000 dwellings with average household size of 2.5 persons. Multi-family housing accounts for about 1,000 or 12 percent of those households. The average water use for all utility customers is 97 GPCD. However, some residents have private wells for irrigation in addition to ABCWUA water for indoor use. Some residents use Middle Rio Grande Conservancy District (MRGCD) ditches as a water supply for irrigation (1,275 parcels). Valley residents could have a combination of three different water supplies. Therefore, since other sources are used for outdoor water, the GPCD is considered to be a low number, and not reflective of actual overall water use.

North Valley neighborhoods range from developed subdivisions to clusters of widely divergent housing sizes, lot sizes, and water uses. The North Valley has areas of small ranches with livestock that includes horses, buffalo, and other large animals. The average home sale price is $201,598. North Valley residents' income is distributed across the five income quintiles (see Figure 2 for details), from $14,000 to $130,000.

The North Valley has a very strong preservation ethic – preservation of a traditional way of life, agricultural heritage, and its remoteness and ecology. The neighborhood associations are vocal and involved. Many residents can trace their lineage to the earliest settlement of the Valley. Those who have moved to the North Valley tend to support preservation of the rural ambience and strongly oppose new development.

1.3.6 Village of Los Ranchos de Albuquerque

The Village of Los Ranchos de Albuquerque was formed under the laws of the State of New Mexico on December 29, 1958, and is an incorporated municipality located within the North Valley study area. Surrounded by Albuquerque, the Village covers about 2,500 acres, 123 of which are used for commercial purposes. Although parts of the Village have changed from open space and agricultural usage to residential development, a very strong sense of community and commitment toward maintaining the area's rural character are Village hallmarks. The Village has tripled in population since 1970. According to 1999 Census Bureau information, 51 percent of residents are employed in management and professional services, 25 percent in sales and office occupations, and 0.6 percent whose primary income is from agriculture. The median household income in 1999 was $60,500.

1.3.7 South Valley

The South Valley study area has a population of about 46,000 residents living in about 15,000 households with an average household size of 3.0 persons. 95 percent of the population have incomes in the lower three quintiles of income, from $14,000 to $42,000. There are approximately 1,100 multi-family housing accounts[3]. Approximately 9,000 households have water connections from the ABCWUA. Smaller water systems account for about 700 connections, and domestic wells are estimated to provide water for the remainder, about 5,500 homes. Many of these wells serve more than one family. As in the North Valley, many of the South Valley residents receive MRGCD water for irrigation (1,679 parcels). The average for utility customers is 109 gallons GPCD. Valley residents could use a combination of three sources of supply, MRGCD surface water, domestic wells and ABCWUA water for indoor use; therefore, the GPCD probably errs on the low side.

The South Valley is one of the oldest areas in Bernalillo County, and many families trace their lineage to the earliest settlers in the region whose livelihoods were directly tied to the land and the river. The area was predominantly agricultural until the early 1940s. As such, domestic wells and/or irrigation water provided by the MRGCD have been the principal sources of water for decades. However, agricultural acreage has steadily decreased as the land has been transformed to residential, commercial, and manufacturing uses. Many areas are rural, with small (often less than five acres) farmsteads devoted to growing crops, raising chickens, or grazing horses and cows. A large group of recent Spanish-speaking immigrant (exact population is unknown) may require bilingual materials, and might not be as familiar with water conservation outreach and concepts.

This study area has the largest number of commercial and manufacturing enterprises. Cement plants, brick manufacturers, oil and gas tanks, railroad yards, a massive auto storage center, automobile recycling, and the ABCWUA's Southside Water Reclamation Plant are located along Second Street on the east side of the river.

[3] Number of units per account varies by utility.

1.3.8 South West Mesa

The South West Mesa study area is the south easternmost corner of unincorporated Bernalillo County (see Figure 1). This study area has a population of about 7,000 residents living in about 2,300 households with an average household size of 3.2. The South West Mesa is relatively less well off, as 94 percent of the population have incomes in the lower three income quintiles, from $14,000 to $42,000. There are 16 multi-family housing utility accounts. The average water use for utility customers (all utilities) is about 114 GPCD. Only 159 households have water connections from the ABCWUA. Smaller water systems account for almost 400 connections, thirty one parcels receive MRGCD water and domestic wells are estimated to provide water for 1,700 households, many of which serve more than one family.

The South West Mesa provides affordable housing for many first time homebuyers with new subdivisions being created as development heads west. The average home price is $95,000. This area is seeing explosive growth, particularly on the southern edge of the County. Landscaping is minimal, in southwest style. Because many homes are new, they contain water conservative fixtures such as faucet aerators and toilets. The characteristics toward the southern edge of the County are markedly different from the northern portion of the study area where many homes were built decades ago. There are some scattered affluent neighborhoods, and commercial establishments in this area.

2. AGRICULTURAL USE

The County examined three study areas[4] that have significant agricultural water use from the MRGCD surface waters: North Valley, South Valley and South West Mesa. Some County residents in all three areas receive allotments from the MRGCD[5], which is the governmental agency that manages and delivers irrigation water.

The number of parcels receiving MRGCD water for irrigation (Strech, 2005) is as follows:

South West Mesa:	31
North Valley:	1,275
South Valley:	1,679
Total:	2,985

The MRGCD water delivery system is made up of ditches that are used to deliver surface water to individual properties or parcels, with turn-outs at each property that can be opened for delivery of water. MRGCD has recently undertaken efforts to conserve water, including lining ditches, metering diversions and delivery canals, and adding automatic control gates to dams and canals (BBMP, 2005). In a discussion on agricultural water conservation, the role of the MRGCD system is cited as critical in the surface water/ground water relationship (BBMP, 2005).

A Bureau of Reclamation study (BOR, 1997) examined the amount of acreage for different land uses in the County from 1955 to 1993. The study showed that the amount of irrigated agricultural acreage has declined significantly in Bernalillo County, especially in the North Valley, South Valley, and South West Mesa study areas. An estimate of further reduction in agricultural acreage since the 1997 BOR report was made by visually reviewing 2004 orthophotos and comparing them to the previous data. The technique

[4] The agriculture areas in the East Mountains using acequias were not considered as part of this study.

[5] MRGCD water is a property right associated with the land ownership, and those properties with MRGCD rights pay an annual tax to MRGCD.

estimated that in 2004 there were 6,562 acres being irrigated and 3,214 agricultural acres not currently being irrigated (Table 1).

Table 1. Water Use and Irrigated Acres over time

Year	Irrigated Agricultural Acres	Non-Irrigated Agricultural Acres	Surface Water and Ground Water Consumptive[6] Use for Agriculture in Bernalillo County
1955	16,071	4,419	21,893
1975	12,667	2,611	20,921
1993	8,489	3,397	20,375
2004	6,562	3,214	22,310[7]
	% Change	% Change	% Change
1955-1975	-21	-41	-4
1975-1993	-33	30	-3
1993-2004	-23	-5	9
1955-2004	-59	-27	2

Source 1955-1993 data: BOR, 1997
Source 2004 acreage data: Weston, 2005
Source 2004 water data: MRGCD, 2000

The water applied to crops either goes into the plant itself, is evaporated from soil into the air (evaporation) or evaporated into the air from the plant (transpiration), or penetrates the soil. The combination is known as evapotranspiration (ET). The rate of ET varies according to the plants themselves, time of day the irrigation water is applied and weather conditions. Several studies have examined the role of agriculture in ground water, and other studies have looked at the relationship between ground water and the deeper aquifer. The BOR calculated the relationship between applied irrigation water and recharge to the aquifer. According to BOR calculations, irrigated agriculture contributes to the ground water system at a rate of 0.7 acre feet per acre, which is an average across crop types and soil types in central New Mexico. The 0.7 acre feet contributed to the groundwater system is what penetrates the ground from the estimated 3.4 acre feet (average) applied per acre (MRGCD, 2000). The remainder is used by the plant or lost to ET.

Since the amount of irrigated agricultural acreage has declined over time, the amount of estimated recharge from agriculture has also declined. The 2004 estimate of agricultural acreage and the BOR calculated average of 0.7 acre feet per acre were used to estimate 2004 recharge. An estimated 4,600 acre feet of water was recharged to the aquifer in the Bernalillo County area (from irrigated acreage) in 2004. Details on the amount of recharge from irrigated acres can be found in Appendix D.

The water delivery system itself, as it is currently configured, loses a certain amount of water to evaporation, seepage below the canals, and transpiration by vegetation along the ditches. That amount of

[6] In this report, consumptive use is defined as evapotranspiration by crops, assumes adequate water, that plants are disease free and have enough nutrients to support growth. These are probably overestimates for dry years. Consumptive use has increased from 1955-1993. Consumptive use estimates have changed drastically over time, in 1995, the BOR used the Blaney-Criddle model, and by 1999 developed the ET Toolbox, which came up with differing estimates. Therefore, the amount applied per acre as estimated by the MRGCD was used for the 2004 data, in lieu of crop consumptive use modeling estimate.

[7] Based on 2000 data from MRGCD for amount of water applied.

loss from the system is the same, regardless of how much or how little is used on individual properties[8]. In the water budget calculated by the BOR, canal seepage provides nearly four times the amount of recharge compared to the recharge from the agriculture acreage (0.2 foot per day). (BOR, 1997) The seepage from conveyance channel supports vegetation along the banks, which provides environmental and aesthetic benefits to the community, such as wildlife habitat.

Currently, some scientists are working to better understand what happens to groundwater beneath ditches and irrigated fields. Some believe that different geologic and soil conditions throughout the valley may prevent groundwater from reaching the deep aquifer in some areas. Some scientists also believe that seepage from fields creates a mound in the water table which eventually dissipates and flows back to the river over the course of several weeks when irrigation seasons ends.

3. CURRENT WATER USAGE REPORT

Bernalillo County commissioned a study in 2005 to gather current residential water use information for the unincorporated portion of the County. The study is included in Appendix D. The study included gathering information from each of the utilities that serve residents in the area, gathering information on amount of water used by residents on utilities, and estimating numbers of residents who are using domestic wells. The data were then analyzed to calculate gallons per capita per day (GPCD), a common baseline measure for conservation programs across the country. Wherever utility data were available, GPCD was calculated for each study area using utility-supplied information. GPCD was estimated for domestic well users based on extremely limited data from the Office of the State Engineer (OSE) Water Administration Technical Engineering Resource System (WATERS) database. (See Appendix F for further information on the limitations of the data). Another important measure for conservation is volume of water used. Overall volume used in the County was estimated using utility data where available, as well as domestic well consumption data from the WATERS database.

The bulk of information on current water usage is being incorporated into the County's geographical information system (GIS) system and will be available on the County website (www.bernco.gov). The Water Usage Report includes socioeconomic data and utility information. See Figures 1 and 2 for comparative demographic information (references to County include the unincorporated area only).

3.1 RESULTS OF THE WATER USAGE REPORT

Based on an analysis of water use patterns, current conservation practices and awareness, the County will focus its efforts to address the specific needs of the study areas. Generally, 37 percent of County residents are estimated to obtain their water from domestic wells, which is a non-traditional target for water conservation programs. An additional 55 percent obtain their water from a major utility (over 1,000 connections). The remaining 8 percent receive their water from smaller utilities in the County. Using GPCD as a measure (see Appendix E for further information on GPCD calculation), NAA/Sandia Heights study area has the highest GPCD, followed by Paradise Hills, the South West Mesa, and the South Valley. However, GPCD may not capture all use in the study areas, in particular the North and South Valley residents may use domestic wells, an un-metered source for outdoor irrigation, in addition to MRGCD water for outdoor use and utility water for indoor use. Based on the GPCD of the utility customers in each study area, the South Valley uses an estimated 45 percent of the water in the County, with 43 percent of the population. Given that this is the largest group and largest user of water, the County should dedicate relatively more resources for educating and influencing that area. The North Valley uses 16

[8] See the section on Agricultural Conservation for a discussion of the role of the legal status of water rights and agricultural use and conservation

percent of the water, with 19 percent of the population. NAA uses 11 percent of the water, with 9 percent of the population. North East Mountains uses 9 percent, with 12 percent of the population. The South West Mesa's 7 percent of the population uses 8 percent of the water. Paradise Hills uses 6 percent of the water for its 6 percent of the population. The South East Mountains uses 4 percent of the water, while representing 5 percent of the population.

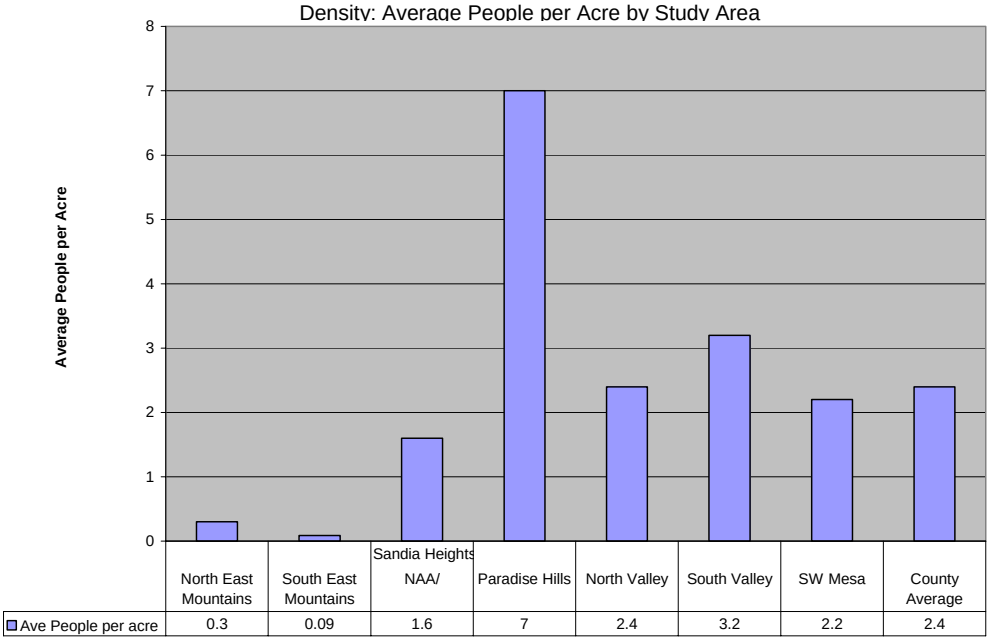
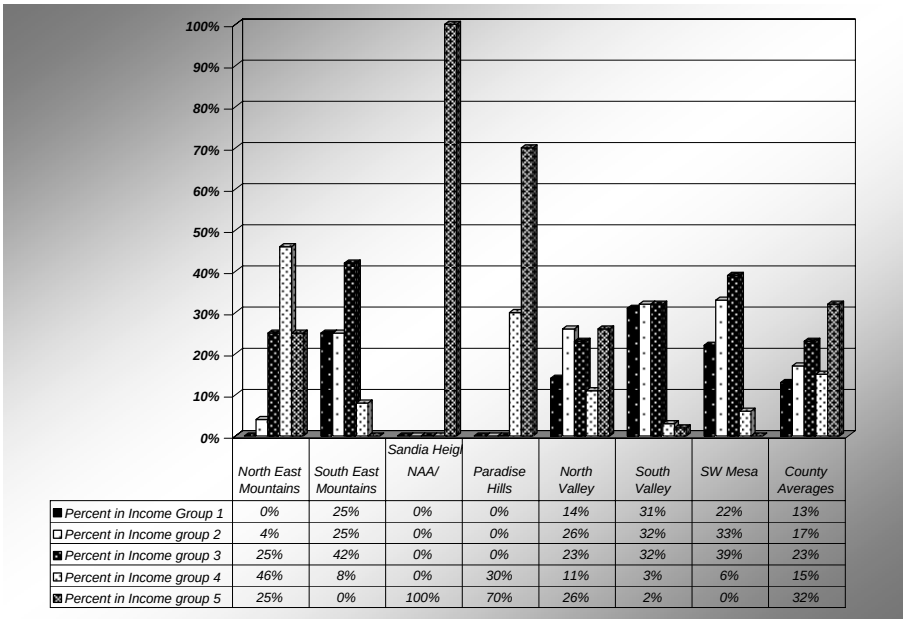


Figure 1. Density by each study area (US Census Bureau)



Income Group Quintiles[9]: 1 $14,181-$27,5382 2 $27,553-$33,8753 3 $33,892-$42,426 4 $42,446-$54,3275 5 $54,327-$130,284

Figure 2. Income Group Quintile by Study Area (US Census Bureau)

[9] The income group ranges were developed by the MRCOG as quintile splits of range of income by household.

Over time, due to the land availability and proximity to infrastructure, Paradise Hills and the South Valley will likely have the greatest increase in population, resulting in the greatest increase in water use. Therefore, issues around land use and development trends should be the focus of the Water Conservation Plan in those two areas.

Paradise Hills is the densest of all of the study areas at 7 people per acre, followed by the South Valley at 3.2 people per acre, the North Valley at the County average of 2.4 people per acre, and the South West Mesa, at 2.2 people per acre. In general, higher density has been nationally correlated with lower water use, in part due to less landscaping and lower square footage relative to other parts of the County.

Residents in the East Mountains have the highest number of domestic wells, whereas residents in the South West Mesa have the highest proportion of domestic wells among the seven study areas. Education about domestic wells should target all study areas except for Paradise Hills, which has a relatively low number of domestic well permits. The OSE data indicate a maximum of 130 domestic well permits in Paradise Hills.

3.1.1 Rate Structures

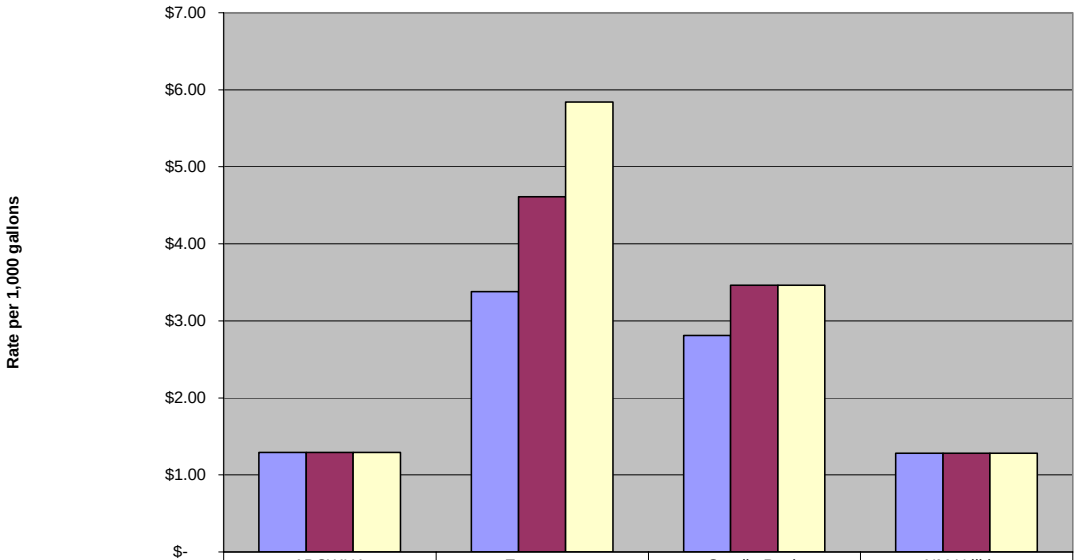
The large water utility providers in Bernalillo County have different rates for different size meters and account types. The rates comparison chart relates to the most common size residential meter, a ¾-inch (sometimes called size 1) connection. The base rates (charged regardless of how much water is used) are added to the commodity (how much water is used) rates in the examples given. The base rate is $11.41 for ABCWUA, $15.00 for Entranosa, $14.87 for SPU, and $10.42 for New Mexico Utilities.

Rates can be structured to influence whether water users use less or more water. Rates that increase as water use increases (provided they are high enough) will tend to promote water conservation. Flat rates do not inherently discourage or encourage water conservation. Some rate structures decrease as volume increases, thus discouraging water conservation.

Although ABCWUA rates are flat, the utility assesses a conservation surcharge, which is assessed based on the amount of water used in the summer in relation to winter (or indoor) usage. Entranosa rates increase in increments: after 9,000 gallons, from 9,001 gallons to 20,000 gallons, and the highest rates for 20,000 gallons or more. SPU rates increase for usage at the break point of 9,001 gallons. New Mexico Utilities charges the same rates regardless of use. Figure 3 shows the rates for each utility.

4. DATA GAPS

In evaluating current water usage, it was clear that the available data on usage and supply are limited. Although the data can properly be used for guidance, more data need to be gathered, and existing data flaws need to be accounted for in evaluating water usage. A number of data gaps were identified. Data from the OSE WATERS database were used, but those data are not reliable for spatial accuracy, consistent entries, or correct information. Information from the County's records was also used to gather data about County water usage, but those data have only been gathered in recent years. For further information on data quality, see Appendix E. Poor data quality, lack of well permit data, lack of accuracy of well permit data, lack of well meter data reported, and the following data gaps have an impact on the data analyzed.



	ABCWUA	Entranosa	Sandia Peak	NM Utilities
1 to 9,000 gallons	$1.29	$3.38	$2.81	$1.28
9,001 to 20,000 gallons	$1.29	$4.61	$3.46	$1.28
20,000 and up gallons	$1.29	$5.84	$3.46	$1.28

Figure 3. Major Utilities – Rates for 3/4 –inch Residential Meters

OSE data are inadequate for evaluating domestic well use. The OSE needs further database entries and data quality review before that information can be used for evaluation purposes. Of the OSE-issued domestic wells permits, only an estimated 25 percent[10] are required to report their use, and overall only 2 percent are actually reporting use. New wells are reporting at a higher rate. Bernalillo County should gather baseline data on domestic well use in the County, and set up a system to solicit voluntary reporting of domestic well use in the County.

The history of water levels (depth of water in feet) and yields (in gallons per minute) of wells for community water systems, domestic wells with meters, and small utilities should be gathered. First priority should be on gathering information in the East Mountains due to the fluctuation of water levels in the area.

Bernalillo County should work with community water systems and small utilities in the unincorporated County to improve data gathering. Data gathering for most of these small utilities should be improved in three areas for water conservation potential: accurate measurement of individual use, apparent losses[11], or real losses caused by system leaks or storage overflow.[12]

[10] Based on a review of a random sampling of water rights permits in the OSE files as part of the water use study, the consultants estimate that less than 25 percent of all permitees are required to meter their wells and report the use data. These are primarily multi-user or multi-uses wells. However, only about 10 percent of those required to report (or 2 percent of the total permitees) actually report their usage.

[11] Defined as water that is consumed but not measured or billed properly, such as through meter inaccuracy or abnormalities that allow water consumption that is not measured

[12] Apparent and real losses are defined by the American Water Works Association.

The definition for multi-family units varies by utility; therefore, it is hard to accurately examine use in multi-family accounts. The County could attempt to gather that data with the utilities and community water systems within its boundaries.

4.1 RECOMMENDATIONS FOR FILLING DATA GAPS

The OSE should gather and make available meter readings from all metered domestic well users, including well shares, and the County could access that data as needed. Bernalillo County should promote voluntary reporting of domestic well use among residents of the unincorporated area. This could potentially occur on a voluntary basis whereby domestic well users supply their information directly to the County via the County web site or at public events. In addition, the County could build on the data gathered to update the County Water Conservation Plan.

Bernalillo County can survey community water systems and small utilities for water conservation potential. Bernalillo County should work with community water systems and small utilities in the unincorporated County to improve data gathering on demographics, boundaries (where applicable), leaks, and system information (AWWA website). Other areas for filling data gaps include gathering information from small utilities on direction and goals for water conservation, level of metering and level of supply wells.

4.2 ASSESSMENT OF PUBLIC PERCEPTION

In addition to gathering data on current water usage, the County reviewed recent water-related surveys in the region (see Appendix G for details) and held two series of meetings throughout the County. The first series of meetings assessed residents' water conservation practices and perceptions, as well as to elicited suggestions for the County's process in putting together a Water Conservation Plan. Meetings were also held after the Water Conservation Plan was developed in order to gather public input on the Plan. A main theme that ran throughout all of the public meetings is the fear that conservation would be applied unfairly, that a person (or business or farm or ranch) doing his/her part to be conservative with water would merely allow others to be careless with water. This perception and fear should be a major focus for the County in its approach. Outlined below are a number of common themes that ran throughout the initial meetings, which were used to help shape the Water Conservation Plan. (See Appendix G for a complete report on the public meetings and for the individual presentations on each of the study areas.)

The following nine themes were developed from the County residents who participated in the public meetings (for further information, see Appendix C):

- THEME 1 – "We know water conservation is important." Most residents who attended are familiar with the importance of water conservation. Therefore, communication resources should be focused on specific methods to conserve water rather than on non-specific conservation messages. This theme demonstrates an overall level of support for a water conservation plan and program for Bernalillo County.

- THEME 2 – Exploring the "Why." The rationale for conservation, as it impinges on water supply issues, must be reinforced in all future communication activities. This theme is addressed in the Communications Plan and outreach to small utilities.

- THEME 3 – "We're already conserving." Most County residents who participated in the five public meetings report they practice conservation measures[13], but the majority of their activities are low-efficiency practices. High-efficiency activities such as xeriscaping, rain-water harvesting, and low-flow fixtures are implemented by a very low percentage of participants.

  Hence, significant resources should be allocated to providing incentives and communicating "how to" conservation measures, with emphasis on high-efficiency results, such as major landscape adjustments, fixture retrofits, and other ideas. This theme is addressed in residential and commercial incentives.

- THEME 4 – "We need more education on conservation issues." This was a very strong theme throughout all the public meetings that reflects a willingness to be informed and educated on water issues. This willingness bodes well for an effective communication campaign. Based on this theme, the thrust of the public communication program should be predominantly educational and informational. This theme is addressed in the Communications Plan.

- THEME 5 – "Don't mess with my well." Many well users are independent souls and express resistance to government intervention in how they operate their wells. The approach to well users needs to emphasize that well owners have a hands-on opportunity to ensure their own future water supply with efficient well practices. This theme is primarily addressed in the Communications Plan.

- THEME 6 – "How can Bernalillo County help?" Although there is some hesitation and indeed suspicion about government intervention in their water use, meeting participants were receptive to a number of potential initiatives that might be undertaken by the County. This theme is addressed in both voluntary and mandatory measures, as well as water conservation incentives that apply in new developments. Bernalillo County should consider implementing the following steps that residents consider would contribute to improved conservation practices County-wide.

  - Tighten laws authorizing subdivisions
  - Institute gray water system incentives for builders/developers
  - Adjust building codes to influence water conservation
  - Consider metering wells
  - Consider tiered billing to promote conservation among utility customers
  - Establish incentive and rebate programs, such as water audits and rewards for low water use.

- THEME 7 – "A diverse universe." Because there are widely divergent interests, concerns, values, and culture among and between the study areas, communications need to be targeted. This theme is addressed in the Communications Plan.

- THEME 8 – "Water Quality." Communications should include a focus on water quality issues with particular emphasis on the arsenic challenge and its remediation, nitrates, and domestic well protection. This theme is addressed in mandatory measures and the Communications Plan.

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[13] The number of County residents that participated in public meetings was small compared to the population. Therefore, the attitudes, practices and preferences of all those who did not attend are relatively unknown. Surveys on water resource topics over the last five years, however, indicate that a majority of people living in this region are supportive of, and practicing conservation. See the report on public meetings in Appendix H for summaries of those surveys.

- THEME 9 - "We need to control new development." County residents who attended the meetings expressed the need to ensure that development occurs in a measured, responsible manner. Bernalillo County needs to articulate current development requirements, and then engage the public in options for water resource management in development. This theme is addressed in voluntary and mandatory measures. Participants suggested some of the following measures:

  - Stricter ordinances and standards for new developments
  - Control of population growth and new housing
  - Encouragement of low-impact development
  - Zoning reviews to limit new development.

Five public meetings were held in five different areas of the County to determine public response to the Water Conservation Plan. After presenting the main concepts of the Plan, comments and questions were noted, and the notes are included in Appendix G. In addition, the County asked public meeting attendees to vote on the recommendations listed in the plan in order to get a sense of public sentiment. The vote tally is summarized below and included in Appendix G.

Top ten recommendations with public support

1. Implement irrigation system standards for existing golf courses, athletic fields, golf courses and new development (excepting single family residential)
2. Implement water budgets for County and private golf courses, and for all County-owned parks and athletic fields
3. Enforce time of day restrictions
4. Implement design regulations for conservation and apply to County facilities and golf courses and new development in unincorporated area.
5. Provide agricultural incentives, such as promote value-added crops, establish small business incubator, convert to more valuable crops, line ditches, laser level fields
6. Establish and promote toilet rebates program with ABCWUA
7. Develop County rebate program for residential (irrigation controllers, cisterns, gray water system)
8. Implement requirements for new development to have a zero footprint
9. Establish a five-tier system for water smart homes, allowing commercial homebuilders to use it as a promotion, and then recognizing homebuilders for the number of water smart homes they sell
10. Amend subdivision code to require low water use landscaping

Ten recommendations to which the public was opposed

1. Implement an ordinance requiring retrofit on resale or remodel – for the remodel portion, the requirement for low flow devices would be added to a permit required for plumbing retrofit
2. Require a meter for those who have four instances of water waste violations
3. Enforce 80/20 landscaping requirement for new development
4. Implement ABCWUA ordinances
5. Require conservation measures for homes over a certain size, starting at 2,500 square feet
6. Require conversion to low-flow devices by a certain date for existing businesses
7. Promote gray water systems through mandatory measures
8. Implement limitations on high water use landscaping
9. Conducts audits for residential users
10. Require new development choice of three approaches for water conserving devices (similar to new Albuquerque requirement)

The voting results indicate areas for the County to focus outreach in order to dialogue with County residents on their perceptions. The voting results demonstrate some contradictions that are most likely a reflection of how the recommendations were worded when the participants were asked to vote. The voting patterns also seem to support the independent character of the County residents. The participants in the public meetings expressed opposition to implementing ABCWUA ordinances. However, five of the top ten recommendations supported by the public are ABCWUA ordinances and another two ordinances listed in the recommendation garnered a slight majority of public support. The apparent conflict in public response may be that the public would indicate support for a specific mandatory measure, but not indicate support for the ABCWUA. An additional seeming contradiction was expressed by support to amend the subdivision code to include low water use landscaping, a mandatory measure, but no support for enforcing 80/20 landscaping requirement, also a mandatory measure. Something as simple as the word "amend" versus the word "enforce" may have influenced the outcome. Interestingly, there was support for conservation measures for homes over 3,000 square feet, but opposition to conservation measures for homes over 2,500 square feet, perhaps a reflection that a 2,500 square foot home may be closer to the norm for public meeting participants, and a 3,000 square foot home may be interpreted as luxury level. Below are some of the ideas that were expressed verbally in the public meetings.

- Conservation Comments and Questions:
  - Why should we conserve? What is the urgency?
  - Support for more stringent conservation measures for new development, particularly for homes 3,000 square feet or larger
  - Major concern expressed about conserving when there is new development (individual homes and large development, such as Mesa del Sol, west side development, Albuquerque) and large users, such as golf courses and swimming pools.
  - Opposition to implementing ABCWUA ordinances, although the residents expressed support for specific ordinances
  - What is the amount and source of water available?
  - What will the Conservation Program cost?
  - Concern about cost and effectiveness of low-flow toilets
  - Concern that agriculture receive credit for the excess irrigation water that recharges the aquifer
  - Could the County provide incentive for residents to supply domestic well data?
  - Disagreement about water use habits of domestic well users
  - Preference for plumbers installing a new water-saving toilet so County residents do not have to bear any expense for the transition
  - Mandatory measures need to be State-wide
  - Opposition to requiring metering for domestic wells

- Don't trust the government because of mixed messages on water (i.e., keep the valley green, but conserve water)

- Ideas and Comments About Other Issues Not Directly Related to Conservation

  - Concerns expressed about the Albuquerque Metropolitan Arroyo and Flood Control Authority (AMAFCA)/Corps of Engineers plan to install flood control structures in the South West Valley, particularly that the flood control structures would decrease the amount of excess storm water available for the ditches.

  - No new development

  - Concern that engineering projects need to account for recharge by slowing down water flow

  - Concern about impairment of wells in East Mountains

  - Some County residents suggested that the County work to prevent water rights from being sold outside the County.

  - Concern expressed for potential contamination from septic systems – solution suggested was to incorporate wastewater system planning into new development.

5. CONSERVATION MEASURES

Measures to achieve water conservation fall into three categories: (1) program actions, (2) voluntary measures, and (3) mandatory measures. Program actions refer to measures that can be taken directly by the County to implement or encourage water conservation. Voluntary measures refer to measures, such as education or incentives, to promote water conservation. Mandatory measures are those that are regulatory in nature. These measures can be combined or phased in over time. The range of options varies, depending upon the practices and preferences of the County residents and businesses, as well as the political will of the County leadership. Therefore, a combination of voluntary measures, mandatory measures, and program actions needs to be evaluated by the County. The Implementation Plan in this document covers more fully the range of options.

Program actions by the County are important in taking steps to encourage citizens and businesses to practice conservation by modeling good conservation practices.

Bernalillo County can implement voluntary measures by providing education on how to conserve, and by providing incentives to conserve. One incentive program is to provide rebates or water conserving devices to County residents for practices that promote conservation. Incentive programs are by their nature voluntary and reward the participants. Rebates and other incentives are usually more costly for the sponsor than other measures and have far lower participation rates, but they are more readily accepted politically and more popular with the public. Rebate and give-away programs do not generally violate the anti-donation clause because the goal of rebates is to decrease water use, which ultimately benefits the public. In addition, rebates that encourage individuals to conserve may serve as an encouragement to other individuals, thus increasing the amount of water saved and public benefit.

Mandatory measures usually have fines or penalties for nonconformance, are generally easier to administer than rebate programs, and have high participation rates. Mandatory measures are considered to be the most effective at instituting change for conservation, but pose more political, legal, and consumer problems. Bernalillo County can phase in mandatory measures over time, beginning by strengthening existing ordinances and developing new ordinances for the County as appropriate. The

County can also work with other entities to encourage State-wide mandatory measures, and work with community water systems and neighboring water utilities to coordinate efforts. The range of mandatory measures that could be considered and phased in over time is outlined more fully in Section 5.3.

Conservation can be encouraged in different ways. The simplest application to minimize impact on current County residents is to require conservation measures for new development, so that it is incorporated from the outset, and to provide incentives for existing homes to conserve. Strategies that target outdoor water use (landscape and irrigation water use) are gaining popularity in conservation programs as the plumbing code changes have slowed the rate of return on programs that target indoor water use. The potential to save water in inefficient irrigation systems, including agricultural use, is significant.[14]

5.1 PROGRAM ACTIONS

The County should designate or hire staff to implement the Water Conservation Plan, depending on the budget and range of options that the County chooses to pursue. To direct the water conservation program, the County should set overall goals for the County, goals for County staff, and for household and individual conservation goals and publicize them. However, because the County constituency has many sources of water supply, and there is very little data about many of the sources, it is important for the County to gather more data in order to have a baseline for comparison against program goals. In order to incorporate County stakeholders in the water conservation program, and tailor it for maximum benefit, Bernalillo County Water Resources program staff should set up an advisory board for the program implementation and ongoing feedback. The advisory board should be composed of representatives from the specified study areas to cover all constituencies, including major and smaller utilities. In addition, the advisory board should coordinate closely with the Water Resources Advisory Committee that is advising the ABCWUA, either with members in common, or a designated liaison. An alternative to an advisory board is for County staff to interact with all of the neighborhood associations for the desired community input. Outlined below are some initial goals for proceeding with the Conservation Plan.

5.1.1 Initial Goals

Short Term Goals:

- Reduce use (primarily through education and implementation of conservation for County facilities)
- Set percent goal for individuals, households, and businesses for reduction in use (for the unmeasured water use, the County should provide information for calculating current water use and areas for savings)
- Gather baseline data on water use (domestic well use, number of domestic wells, level of metering among small utilities)
- Outline advisory committee criteria

[14] In a study performed by the California Urban Water Conservation Council of the cost effectiveness of their Best Management Practices, landscape/irrigation audits and irrigation budgets were the only BMPs that were cost effective every year in every region of the state, regardless of customer make-up, drought conditions, or cost of supplying water.

- Set up advisory committee
- Develop drought response plan

Intermediate Goals:

- Reduce use (via incentives and ordinances)
- Continue to evaluate water use patterns and close data gaps, including information on available supply

Long term Goals:

- Set reduction goals
- Gather data to evaluate reduction compared to baseline data

5.1.2 Program Actions Recommendations

Bernalillo County should act as a role model for water conservation. Some of the areas where the County can lead by example are as follows:

- Implement County Water Conservation Plan for facilities (impacts are outlined in the Water Conservation Plan for Bernalillo County Facilities [Facilities Plan])
- Use County facilities as demonstration sites for climate adapted landscaping
- Implement best management practices (BMPs) for conservation
- Develop water budget for County facilities and parks
- Promote low impact design for County engineering to maximize the amount of recharge, decrease the amount of storm water run-off and improve water quality

Bernalillo County staff should work with key stakeholders to create incentives for conservation directly for Bernalillo County. Bernalillo County should also work in collaboration with other counties and communities in the region. Some areas where the County could work regionally are as follows:

- Work with other entities for New Mexico Public Regulation Commission (PRC)15 changes to adopt requirements for conservation rates for utilities regulated by the PRC in New Mexico.
- Work with Middle Rio Grande Water Resources Board (Sandoval, Valencia, Bernalillo Counties and municipalities in the region) and directly with other neighboring governmental entities for implementation of conservation measures identified in the Middle Rio Grande Regional Water Plan.
- Work with AMAFCA to coordinate implementation of the South Valley projects and its impact on County residents. The Water Conservation Plan and AMAFCA planning should be coordinated, and low impact design should be included in that process.

[15] PRC governs public utilities, which excludes utilities owned by local government and mutual domestic water associations

5.2 VOLUNTARY MEASURES

This section discusses a variety of potential voluntary measures that could be implemented around the county.

5.2.1 Outreach to small utilities

Bernalillo County's goal of maximizing conservation in unincorporated Bernalillo County will ultimately benefit the residents by helping to protect water resources for the future. In gathering information for the Water Usage Report, many of the smaller utilities were difficult to contact, as oftentimes staff or board members work part-time and/or as volunteers. In addition, many of the community water systems have inefficient distribution systems, which they have no means to repair. Mobile home parks without submetering on individual mobile homes are often wasteful of water because of the inability to detect leaks or determine sources of waste. Submeters are reported to reduce water use by 20 to 40 percent. (USEPA, 2006.) The County can play a leadership role with community water systems and small utilities to help them achieve conservation, particularly in the areas of system losses and customer leaks. Bernalillo County can potentially use incentives and education to help them operate more efficiently.

Bernalillo County can assist with education in the following areas:

- Assist mobile home parks to submeter individual mobile homes[16]
- Assist small utilities in performing regular meter testing and repair[17]
- Assist small utilities systems in determining the amount of non revenue water
- Provide assistance with grant writing for implementation of conservation measures
- Provide assistance to augment or establish water conservation programs
- Provide leak detection audits for small utilities
- Provide leak detection audits to small utilities' customers
- Assist small utilities in conducting audits to track spikes and meter readings of zero to determine if reading is correct
- Assist small utilities in tracking non traditional uses, such as fires, flushing and treatment

5.2.2 Incentive Program for Residents

Other water conservation programs around New Mexico and the country were reviewed for lessons learned on incentive programs. There are only a few examples of other counties developing a water conservation program (Santa Fe County, NM and Pima County, AZ). Conservation customer incentive programs are normally administered through a utility billing system and would need to be adapted for use

[16] Some options include providing incentives to mobile home parks for installing submeters to mandating submetering. ABCWUA has considered an ordinance to submeter all new apartment buildings and mobile home parks.

[17] This measure could also be achieved by incentives or a mandate.

by the County. (For details on incentive programs reviewed and lessons learned, see Appendix H.) Economic and incentive options for Bernalillo County must consider the large number of both metered and unmetered wells, shared wells, agricultural use, and the numerous water providers, including mobile home parks, utilities, and community water systems. Aside from the ABCWUA, the largest providers are New Mexico Utilities serving Paradise Hills, Sandia Peak Utilities serving the far Northeast Heights, and Entranosa Water and Wastewater serving the East Mountain area.

The ABCWUA serves the incorporated areas of the City of Albuquerque, but also has connections in several of the study areas in the unincorporated areas of the County, most notably in the North and South Valley (see Appendix I for details on the ABCWUA, goals, how it came into being, and the organizational structure). As the County develops a Water Conservation Program, given that that the ABCWUA is a joint agency of the County and the City of Albuquerque, the two entities may wish to discuss rebate and incentive programs (see Recommendations for Economic and Incentive Alternatives for more details) for possible areas of cooperation.

The following voluntary measures are recommended for consideration:

5.2.2.1 Capitalize on existing rebates

The County should publicize availability of existing ABCWUA rebates to eligible County residents (those who have or will have ABCWUA water service). As County residents connect to ABCWUA water service, the County should offer audits and encourage residents to participate in ABCWUA water conservation programs, such as the toilet rebate program to eligible County residents (see above).

5.2.2.2 Promote indoor savings with low-flow fixtures, such as toilets and water efficient washing machines

The County could develop a Bernalillo County program promoting use of low-flow fixtures. Under current plumbing code, a toilet can use no more than 1.6 gallons per flush (gpf) or less in the U.S. The County may want to consider providing rebates or giving away toilets that use even less water than the maximum allowed. For the purchase of other water efficient fixtures and appliances, such as washing machines or dishwashers where consumers have a choice on the efficiency of the appliance they purchase, the County may want to consider means to encourage the purchase of the more efficient property tax rebate or some other form of an incentive. Low-flow toilet incentives should be targeted at homes that are older than 1995 and not likely to have been improved.

Toilets

On average, toilets are the largest source of indoor water use, and thus are a good place to focus for long term savings in water use. Well-designed low-flow toilets[18] (1.6 gpf) are estimated to save on average 10,000 gallons per year in a typical household. The other toilets described above would have even greater savings than indicated in these paragraphs and the table below. The ABCWUA rebate for residential use is $125 for the first toilet, $75 for a second toilet, and $50 for a third one. Non-residential properties are eligible for a rebate of $90 per toilet. The cost benefit analysis has to consider the useful life of the toilet because while the rebate cost is a one-time expense, the water savings continue for the life of the toilet. Assuming a useful life of 25 years[19], the total savings would be 250,000 gallons for the cost of $125. A

[18] Some of the early toilets from the 1990's and some of the currently manufactured cheapest models do not operate efficiently and may clog or require more than one flush. It is important to choose a brand and model carefully based on performance criteria. Public meeting participants expressed some trepidation about the performance of low flow toilets, which have a generalized poor reputation, despite many models and brands that perform well.

[19] Estimate by the City of Santa Fe in 2003.

single family home would save at least $400 in water consumption at current ABCWUA rates. Since rates tend to rise over time, the savings would continue. Table 2 shows typical water gallons savings based on household size and number of toilets.

Table 2. Single Family Savings for Retrofitting to an Ultra Low Flow Toilet (1.6 gpf) (Gallons per Household per Day)

Persons per Household	Toilets per Household[a]															
	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
2.0	22.8	24.3	25.7	27.1	28.5	29.9	31.3	32.7	34.1	35.5	37.0	38.4	39.8	41.2	42.6	44.0
2.1	23.8	25.4	27.0	28.5	30.0	31.5	33.0	34.5	36.0	37.4	38.9	40.4	41.8	43.3	44.6	45.9
2.2	24.6	26.4	28.0	29.6	31.2	32.8	34.3	35.9	37.4	38.9	40.4	41.9	43.4	44.8	46.1	47.4
2.3	25.3	27.1	28.8	30.5	32.2	33.8	35.4	37.0	38.5	40.0	41.6	43.0	44.5	45.9	47.2	48.4
2.4	25.8	27.7	29.5	31.2	32.9	34.6	36.2	37.8	39.3	40.9	42.4	43.8	45.2	46.6	47.9	49.0
2.5	26.4	28.2	30.0	31.8	33.5	35.2	36.8	38.4	40.0	41.5	42.9	44.4	45.7	47.0	48.2	49.3
2.6	26.8	28.6	30.5	32.3	34.0	35.6	37.3	38.8	40.3	41.8	43.3	44.6	45.9	47.2	48.3	49.3
2.7	27.1	28.9	30.8	32.6	34.3	35.9	37.5	39.0	40.5	41.9	43.3	44.6	45.9	47.0	48.0	48.9
2.8	27.3	29.1	31.0	32.8	34.4	36.0	37.6	39.1	40.5	41.8	43.1	44.4	45.5	46.6	47.5	48.2
2.9	27.5	29.2	31.1	32.8	34.4	36.0	37.4	38.8	40.2	41.5	42.7	43.8	44.8	45.8	46.6	47.2
3.0	27.5	29.3	31.0	32.7	34.2	35.7	37.1	38.4	39.6	40.8	41.9	42.9	43.8	44.6	45.3	45.8

a. Estimates in the table are accurate within ±5 percent of model estimated water savings.

These calculations are from the California Urban Water Conservation Council (CUWCC) based on extensive studies of low-flow toilet retrofits. If only one toilet were replaced in the 28,000 homes that were built in 1995 or before, using the County-wide average household size of 2.7, the savings projected for Bernalillo County would be 276,962,000 gallons annually for a one-time cost of $3.5 million.[20] Again, the amount of water saved would higher for toilets that use less than 1.6 gpf, but the cost for the program would be higher as well. The cost per gallon saved is highly variable, as toilets can range from rated usage of 3.5 gpf to 7.0 gpf, and replacement toilets can range from no water used for chemical-based urinals, 0.8 for the lower end of a dual flush toilet, to 1.0 gpf for some newer models and urinals, to 1.6 gpf for the "normal" low-flow toilet.

The County has several options for promoting low-flow toilets. It could develop a replacement program, whereby the County would contract to purchase a large number of toilets, contract for plumbing services, and have them installed in homes of residents that wish to retrofit and replace an existing high-flow toilet using 3.5 gpf or greater. Toilets cost between $40 and $1300, but the County should consider minimum performance standards for toilets so that residents are not installing toilets that require more than one flush or clog frequently.

Another option for toilet replacement is through a special event such as a toilet giveaway. Toilet distribution events create a significant water savings through a short-term intensive effort, and the savings begin immediately. Toilet distribution programs have been successful in other communities. The City of

[20] Based on $125 cost per toilet. In addition, the one-time acquisition cost for the amount of water saved, at $5,000 per acre foot to purchase water saved, is $3.5 million. Since the benefits of toilet replacement continue over time, and water costs will only increase, there is a significant positive cost-benefit ratio for a toilet replacement program.

Santa Fe conducted a distribution program in 2002, giving away about 8,000 toilets.[21] The cost of the programs which included toilet, showerhead, and faucet aerator giveaways averaged, about $102 per set of water saving devices. The overall projected water savings over the 25-year life of the toilets was about 2 billion gallons of water, and the program cost for every 1000 gallons of water saved was estimated to be about 41 cents. The average estimated savings per toilet/showerhead/faucet aerator set of devices was about 14,600 gallons per year each.

Many communities in southern California have conducted large-scale toilet distributions. The giveaway programs are usually organized as follows: the toilets are distributed from an easily accessible place, such as a high school parking lot during specific hours; availability is on a first-come, first serve basis; residents must show proof of residency; residents are given about two weeks to install the new toilet; and then a second event is held to collect the old toilets, which are then recycled. If the resident does not return the old toilet, their water account is charged for the cost of the new toilet. Although these programs are typically administered or paid for by the water utility serving the area, Bernalillo County could sponsor a distribution directly, providing the toilets to property tax payers only, and assessing them on their property tax bill if the old toilet is not returned.

The County could also work with Bernalillo County retail outlets and plumbing supply outlets to recognize and accept a coupon for toilet purchases that meet County criteria. The County should set performance criteria, and then provide educational material for retail and plumbing supply outlets. In addition, it will be important to work with management and staff to be sure that all floor staff understand the County program and can help customers with eligible toilet choices.

This program could also occur in conjunction with ABCWUA, through an amendment to the existing Joint Powers Agreement, to coordinate a rebate program for County residents not already eligible under the ABCWUA service area for toilets, washing machines, and irrigation efficiency improvements. Additionally, the County could negotiate with ABCWUA to allow County residents participating in the Partners in Improving and Protecting the Environment (PIPE) program to apply for a toilet rebate even without water service.

Water-Efficient Washing Machine

According to the CUWCC, replacing a high-flow washing machine with a water-efficient machine can save almost as much as much as a low-flow toilet, depending on how efficient the washing machine is, how many loads are done per week, how much water the old washing machine was using, and other related factors. Water-efficient washing machines are much more expensive than low-flow toilets, so the cost benefit to the consumer may not be as high in terms of water savings. However, the energy savings are considerable (up to two-thirds less energy). The cost of the water-efficient washing machine takes into account the incremental costs between the water-efficient washing machine and a comparable machine that is not water efficient, usually in the range of $400 to $1000 per machine. While the cost of the washing machine is greater than the cost of the toilet, the County can choose to offer a rebate of any amount. The ABCWUA currently offers a $100 rebate for a water-efficient washing machine, which is less than the rebate for a toilet. Water-efficient washing machines generally cost between $500 and $1200.

The County should determine the amount of rebate for water-efficient washing machines for residents. Bernalillo County should then work with retail outlets and plumbing supply outlets to recognize and accept a Bernalillo County coupon for the washing machine rebate. The program should develop an

[21] The program was originally intended for residential users only, but was expanded to include businesses when the residential market did not absorb all the toilets the City purchased in the short time provided.

application form for residents who demonstrate that they have replaced an inefficient model with an efficient model, and provide them with a coupon for an instant rebate at the retail or plumbing supply outlet.

Another option would be for the County to purchase a set number of water-efficient washing machines and conduct an annual lottery drawing to award a washing machine to County residents.

5.2.2.3 Audits

Water efficiency audits or leak detection audits may be offered free of charge to County residents. Single and multi-family residential audits can save 7,000 to 8,000 gallons per year for a single family[22]. In addition to leak repair, audit visits will include other traditional recurring savings elements, such as showerhead and aerator replacement, toilet displacement bags (in lieu of replacing a toilet with a lower water use toilet), and improved irrigation schedules. Single and multi-family residential audits are difficult and costly to administer and have a lower cost benefit ratio than some other measures. An audit requires a scheduled visit to the home, for about 45 minutes to an hour, with the resident present throughout the audit. One staff can complete about five single family audits per day. Audits cost anywhere from $40 to $200 each. In Bernalillo County the costs would likely be higher because of the driving distances to County residents, which would increase the time and travel costs. Contracting with local water utilities to provide the audits is an option that would eliminate some of the problems of long distances, but would be very difficult to establish, monitor, and effectively manage.

The savings for residential water audits include savings from retrofit of high-flow devices with low-flow, and savings from changes in human behavior associated with the audit. The retrofit savings attributable to low-flow showerheads and aerators will continue for the useful life of those devices, but the behavioral changes could wane over time. Therefore, some of the projected savings may decrease. Also some retrofit or changes may be completed over the years as the homeowner or business can afford to make the changes, resulting in increased savings down the line.

5.2.2.4 Domestic wells

Metering encourages water conservation and better monitoring of usage patterns and trends; therefore, incentives would benefit the welfare of County residents (USEPA, 2006.). Bernalillo County could offset the cost of the meter by taking responsibility for the annual water quality sampling for the homeowner and not requiring the homeowner to pay the fee for the well permit. As an additional incentive, the County could pay for the cost of the meter.

5.2.3 Incentives for Outdoor Conservation

Incentives for outdoor conservation include irrigation controllers and other techniques, such as cisterns, gray water systems, or weather sensing irrigation systems. Audits and metering domestic wells are also useful incentives.

5.2.3.1 Landscape Efficiency

Irrigation controllers are electronic or mechanical devices used to control time of day and duration of irrigation, and thus are a potential source of water conservation. The controllers cost approximately $100 or more and, used correctly, save roughly 15 percent of outdoor water use. The cost benefit ratio depends

[22] For utility programs that focus audits on households whose use spikes with a probable leak, the average amount of savings would be higher.

on the site, the size of the irrigated area, the plant mix, and watering schedules. A rebate for irrigation controllers has proven to be popular with customers in the other programs surveyed.

For existing homes, rebates could be given to homeowners for the installation of cisterns (cost between $150 and $500, depending on installation), gray water systems (cost between $500 and $10,000), or weather sensing irrigation systems. These rebates are typically between $35 and $75. Savings effectiveness is not well quantified, given the relative rarity of these systems. Savings are dependent upon the amount of rain, individual habits and the extent of modifications done. For retrofit of existing homes, these systems are not expected to offset their cost; however, they are popular with the public.

5.2.4 Water Conservation Incentives that Apply in New Developments

Water conservation incentives that apply in new developments include rebates for developers and incentives for metering domestic wells. One option is to provide a rebate to developers for incorporating water conservation measures, either for rainwater harvesting or irrigation efficiency in new development. For example, a lot to be developed would be eligible for a $300 rebate with the submittal of a water harvesting plan to capture water from a minimum of 85 percent of the roofed area for use in landscape irrigation (incorporation of the design in the landscaping plan might add between $100 and $1,000 in cost). Bernalillo County would have to develop general guidelines for evaluation criteria for water harvesting plans. In addition, a residential development with 2,500 square feet or greater of heated area, would be eligible for a rebate by installing a cistern that is buried, partially buried or housed within an insulated structure. On smaller homes, the installation of a system to capture rain could render a development eligible for a rebate.

Water conservation incentives for developments of less than five lots could be implemented for a water conservative site design (i.e., capture of rainwater for on-site landscaping use, if landscaping is planned). The County could consider a range, perhaps between $25 and $250. The program could match the ABCWUA with a $25 rebate for a rain water harvesting barrel, $100 for an installed cistern system (much more expensive), $250 for cistern plus a water-conserving landscape utilizing permaculture features, as the latter requires more effort. For homes that are built to completely re-use the water on-site and treat it, a permit will be required from the County, but that home would be eligible for a $750 rebate, as a system to re-use the water on-site would be costly to install ($10,000 or greater).

The Southern Nevada Water Authority just started a program in collaboration with the Home Builders Association to recognize homes, neighborhoods, and builders who build to the Water Smart Home standard, which exceeds the current plumbing code. These homes meet efficiency standards for landscaping, have high-efficiency washing machines, dishwashers, hot water systems, cooling systems, and dual flush toilets. Although there is no financial incentive, the Water Authority publicizes the program and promotes buying the Water Smart Home. KB Homes is the only builder designated as a "Water Smart Builder," which means they have committed that every new home they build will meet the higher standards.

Incentives for metering domestic wells for new homes could be provided to encourage water conservation and to better monitor usage patterns and trends. Bernalillo County could offset the cost of the meter by taking responsibility for annual water quality sampling. As an additional incentive, the County could pay for the cost of the meter (cost between $350 and $500).

The County could develop a recognition program for residents or businesses that demonstrate good conservation practices, such as xeriscape landscaping, retrofits or changes in employee habits. The results could be publicized in the local papers and other venues.

5.2.5 Incentive Program for Agricultural Use

The major difficulty in developing a conservation program for agriculture is that existing state law does not recognize conservation as a beneficial use. When agriculture uses water, it is based on a water right, which is a property right. That property right is subject to the OSE determination that the water right is being put to beneficial use. Any water right that has not been put to beneficial use for four years can be subject to forfeiture (in other words reverts to a public good). Therefore, the concept of "use it or lose it" does not currently support conservation by agriculture.

However, if an agricultural user were willing to conserve, and then use that water right to support processing of a value-added crop, such as processing green chile, that would be a way for agricultural users to conserve without losing a water right. If water conservation or in-stream flow were recognized as beneficial use under state law, then the County could potentially support more efficient use of water by supporting adding value to existing crops. One potential method for adding value to crops that use ABCWUA water is the small business incubator in the South Valley. Another option is for the County to provide incentives for conversion to more water-efficient and profitable crops, such as lavender. Other options for agricultural conservation include lining ditches or laser leveling of fields, which can be supported by existing programs such as through BOR or National Resources Conservation Service (NRCS). Bernalillo County could also support on-farm efficiency in conjunction with the MRGCD, whereby MRGCD ratepayers would decrease the amount of irrigation water used, and lease that unused water, if vested water rights are quantified and protected (BBMP, 2005). Agricultural users over a certain size would have the option to pursue federal funding for assistance with on-farm efficiency, which the County could help publicize.

5.3 MANDATORY MEASURES

One of the most effective conservation measures is the implementation and enforcement of mandates for conservation. It is important for the County to consider water conserving measures through revision of the County Subdivision Code, adoption of ordinances, and lobbying for regulatory change at the state level to promote conservation. Although the County has some measures in place that would help promote conservation, the development process and Subdivision Code could be amended to do more. Agricultural exemption standards should be included for County residents. Since the County and the City of Albuquerque jointly govern the ABCWUA, it would help residents and developers' understanding and acceptance of water conservation mandatory measures to have uniform ordinances across the entire County. Therefore, the County should review existing ABCWUA ordinances and consider adopting similar ordinances for the unincorporated portion of Bernalillo County. The County should consider other ordinances even if not yet adopted by the ABCWUA. In addition, the County should lobby State government measures to take in order to promote water conservation. (See Appendix J for a review of the overlapping jurisdictions that play a role in Bernalillo County.) The following ordinances, at a minimum, should be adopted:

- Time of day watering (restrictions on when irrigation can occur to minimize evapotranspiration)

- Water waste (no fugitive water, no watering impervious surfaces, limit runoff, impose fines). Although this ordinance technically applies to the entire service area, including parts of unincorporated County, for legal purposes it should be adopted and adapted as necessary, by the County. One adaptation for the County is to require a fourth time water waste violator who does not have a meter to install one, and report use to the OSE.

- Planting restrictions (new development, aside from golf courses, parks and athletic fields, already covered by water budgets, are allowed to use only medium- and low-water use plants. Limitations on high-water use landscaping for City housing allow only 20 percent of landscape, with a

maximum of 3,000 square feet; if property is only 300 square feet, the entire property may have high water use landscaping). The County should include this measure for single family residential (see Implementation Plan for more details on administration) because most development in the unincorporated areas of the County is single family residential (Bernalillo County Building, Planning and Zoning, 2005). The place to limit high-water use plants and affect conservation requires that the mandatory measure apply to all equally. This would apply only to lots that are creating landscaping.

- Design regulations for conservation (governs efficient use of water, harvested water and limits on water features for new development, renovation of City facilities and all golf courses) that be applied to County facilities and golf courses in unincorporated area and new development.

- Irrigation system standards (irrigation efficiency applies to existing golf courses, athletic fields, and golf courses, and new development except for single family residential).

- Water budget restrictions to overall use of high-water use plants, amount of water used for city and non-city owned golf courses, and to all city owned parks and athletic fields that can be applied in the same manner to Bernalillo County facilities.

5.4 MEASURES FOR RESIDENTIAL USERS

Bernalillo County should review recommendations recently developed by the Water Resources Advisory Committee for adoption:

- Retrofit on resale or remodel: although fixtures such as toilets are required to be in compliance with the Uniform Plumbing Code standard of 1.6 gpf when a bathroom is remodeled, the County can require a more stringent set of standards, equally applicable to remodeling or upon sale of a home, ranging from requiring water-conserving dishwashers to water-conserving washing machines. Retrofit on resale or remodel will increase the number of homes converting to low-flow fixtures. The retrofit will be the responsibility of the seller/homeowner.

5.5 MEASURES FOR NEW DEVELOPMENT

Having homes and businesses connect to a utility with a meter and sewer system will promote water conservation, because metered use tends to be lower than un-metered use. (EPA, 2006) In addition, promoting connection to a utility will promote the health and welfare of all residents, by decreasing the potential for drinking water quality degradation as a result of septic systems. Decreasing the number of domestic wells will also benefit the health and welfare of County residents because domestic well drilling (location) and capping are not regulated; therefore, it is difficult to locate domestic wells and uncapped abandoned wells at risk to potentially contaminating the aquifer. In order to limit the number of domestic wells drilled for individual lots, there are a range of options. If no utility is available for new development, measures can be taken to require future developments to use less water by limiting the amount of water to be drawn from domestic wells.

Since applicants for building permits have to identify their water source, and will not be issued a Certificate of Occupancy until approved by the County (either sufficient water from a utility or a well), the County could require a meter for single-family wells. Although there is concern and opposition to the metering of domestic wells, meters and reporting consumption data would increase understanding of water use patterns. In addition, metering of consumption has been demonstrated to decrease use due to awareness of volume used. If meters are not required for all new domestic wells, they could be randomly required, for example on one out of every eight wells installed. If legal authorization is granted, Bernalillo County can collect the well information annually, using existing Public Works employees.

Alternatively, the County could promote collection of meter consumption data on a voluntary basis to the OSE (in some cases it would already be required, but the OSE does not currently enforce data reporting). An additional option would be to ask County residents to report use data on an annual or monthly basis to a County website where residents could report anonymously.

There is a wide range of approaches to new development. Other programs reviewed have spent several years addressing the issue of water conservation and new development. Some have been successful in imposing restrictions, conservation standards, or in creating a "zero footprint" in the community. Given the projection of increased water use, the County could adopt a "zero footprint" requirement, whereby new development would be required to assist with the conservation program, either through monetary contributions or by retrofitting existing high-use devices in the community. This would minimize the increased water use in the County, protect existing residential use, and allow for economic activity. On the high end of potential requirements, a community in California requires developers to pay $5,000 for every new single family home or apartment unit built. The money is then used for conservation programs to offset the increased water demand. The City of Santa Fe (and other cities) was successful in requiring developers to install low-flow toilets in order to offset new water demand. Through this program developers retrofitted many toilets in the public schools and restaurants where use is very high and consequently the most savings can be found.

The City of Albuquerque recently amended its subdivision code (Section 4401) to require developers to install one of three conservation devices [23]in all new homes. So far, this approach seems to be working well for commercial homebuilders[24] in Albuquerque. Alternatively, homes over a certain size could be required to incorporate a greater level of conservation measures. ABCWUA is currently working with Mesa del Sol, a large-scale new urban development on the south side of Albuquerque. ABCWUA set water budgets and required the developer to demonstrate that they will meet the water budget. Bernalillo County could consider working with developers of major subdivisions to set water budgets on a per lot and subdivision basis, and then requiring the developer to demonstrate compliance.

Conservation in new development could also be accomplished through setting standards for water smart homes, so that consumers would have the opportunity to choose the level of conservation included in the home as it is built.

The County Code for Subdivisions language should be changed from "should" to "shall" in Section 74-91, *Design Requirements for water management*, item 2, "Low water use landscaping techniques applying the principles of xeriscaping should be utilized." Currently County Code for major subdivisions requires a new home to demonstrate 70 years of water availability, the proof of which varies according to the number of lots being developed (major or minor subdivision).

Bernalillo County staff should also review the County development review process for other conservation opportunities and potentially incorporate those in a new conservation ordinance.

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[23] (1) Hot water recirculating systems, (2) two out of the following three items: efficient dishwasher, washing machine or dual flush toilets, (3)Cooling system that is not evaporative cooling.

[24] Used to designate those entities that are building homes other than for their themselves.

5.6 MEASURES FOR EXISTING COMMERCIAL, INDUSTRIAL OR INSTITUTIONAL WATER USERS

The following measures can be considered for adoption to encourage conservation among existing commercial, industrial[25], or institutional water users.

- Require commercial, industrial and institutional entities to change to low-flow fixtures (toilets, faucets, urinals, faucet aerators and showers) by a certain date. Allow the institutional entities more time than the commercial or industrial sites due to limited budgets and general inability to adapt quickly.

- Adopt other ABCWUA ordinances for uniform mandatory measures County-wide as they become applicable, such as large water users ordinance, car wash restrictions, hospitality industry, water and sewer rate structure for conservation surcharge for water accounts in small utilities, and water budgets for landscape only accounts.

6. COMMUNICATION PLAN

Based on public input and review of best management practices, the County devised a Communications Plan to assist with education and outreach to County residents on water conservation. (See Appendix C for the full Communications Plan.) Bernalillo County should conduct a mass media education/information campaign to all areas with messages regarding the finite nature of aquifer supplies. A sense of urgency will be necessary to galvanize the public interest. All conservation messages will have a two-fold message: (1) Why water conservation is essential to our well-being and (2) Here is how we can do it.

6.1 COUNTY-WIDE EDUCATIONAL CAMPAIGN

A major radio, television, and print campaign, with messages coordinated with the ABCWUA, should be launched to provide the "context" for a County-wide educational and informational initiative. This approach, although not as cost-effective as a targeted campaign, is essential because fully 37 percent of audiences use wells, and there is no direct conduit to them. This mass media approach will serve as an urgent "context" for all County residents to understand the importance of water conservation, and to increase their participation. For the print campaign, the County may want to consider using existing printed materials taken from the ABCWUA to provide a consistent message to County residents.

Bernalillo County must work closely with the water utilities[26] that serve 63 percent of the targeted population. Effectively, these entities are the conduit that will enable the County to deliver conservation messages to their customers. Bernalillo County staff should seek meetings with representatives of these utilities to discuss joint activities such as workshops and conservation demonstrations addressing the interests of utility customers. Bernalillo County can provide these utilities with pre-printed educational and informational bill inserts and other "how-to" materials.

The following key messages are recommended for the educational campaign:

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[25] Although there is not a lot of industry in Bernalillo County, the ordinance can be based on all three classes of users (commercial, industrial, institutional) and would apply to existing industrial customers, and be in place for any new industrial customers.

[26] ABCWUA, SPU and Entranosa all have conservation outreach to varying degrees

- The surface water and ground water basins (aquifers) that serve the County have a finite supply of water.
- The ground water is being mined (pumped out) at a rate faster than it is being replenished.
- Continued prosperity in this region requires that our water supplies be managed with great care.
- Bernalillo County calls upon all residents to conserve as much as possible.
- Bernalillo County will do everything in its power to assist residents in achieving this goal.
- Bernalillo County is embarking on a comprehensive educational and informational conservation program aimed at helping residents save water.

For the County-wide program, the goal should be twofold: lowered water use (measured by metered use, GPCD, and lowered volume usage for the entire unincorporated County). Baseline data should be developed to enable the County to assess progress toward the goal in the next few years. When County residents reach a goal, the achievement should be publicized and celebrated.

As broad public awareness activities are unfolding, a tailored communication plan should be launched in each of the study areas through localized print materials and outreach activities. (See Appendix C, the Communication Plan, for details). Bernalillo County can conduct conservation education outreach in each of the study areas at community events. In addition, educational materials for specific audiences, such as new residents and domestic well users, need to be developed.

The program will consist of educational activities such as seminars and workshops, teaching residents how to minimize water use with high-efficiency appliances, low water use landscaping, water harvesting, reuse techniques, optimum well maintenance, and agricultural conservation. In addition, materials will be developed or adapted and provided to schools for more widespread education.

6.2 EDUCATIONAL PROGRAM FOR AGRICULTURAL CONSERVATION

Bernalillo County can support agricultural users in using their water most efficiently. The BOR and NRCS have educational and grant programs to support agricultural conservation. Bernalillo County staff can work closely with the BOR and NRCS to provide more information on practices that conserve water. The areas to consider, such as laser-leveling of fields and upgrading agricultural conveyance systems, were included as goals in the Middle Rio Grande Regional water plan. Other target areas include lower water use, more efficient irrigation techniques and conversion to higher value/lower water use crops. However, the difficulty in conserving in agriculture is the disincentive to conserve created by the legal requirements for putting water rights to beneficial use.

7. METHODS TO EVALUATE EFFECTIVENESS OF THE CONSERVATION PROGRAM

This section discusses the evaluation of conservation effectiveness.

7.1 VALUE DRIVER ANALYSIS

As an input to the Water Conservation Plan, the County went through a process of evaluating the various recommendations in the Plan for the value to the water conservation program versus the difficulty of implementation. Further details on the process and the entire list of recommendations with their priority

assignment can be found in Appendix M. The values used to assess the success of a Bernalillo County water conservation program are outlined below:

- Effectiveness/change in behavior, as shown in the following measures:
  - GPCD
  - Volume of water used by utilities
  - Volume of water estimated to be used by domestic well users
- Knowledge and understanding
  - Data Availability
  - Level of metering
  - Level of reporting to OSE on those with domestic well meters
- Broad, equitable participation
- Political will/buy-in
  - Conservation-related ordinances passed
  - Public support
- Regional Synergy
  - Regional initiatives for conservation in which the County participates (i.e., lobby the PRC on rates and work with other Counties for development standards for conservation)

The recommendations outlined in the Water Conservation Plan were evaluated by County staff for the highest reflection of value and ease of implementation. The top fifteen priorities, along with voting responses from public meeting attendees, are listed below (in no particular order, other than the first four were ranked as a "1" and the remainder was ranked as a "2"):

- Publicize existing requirements for new development, as well as measures put in to promote conservation (public support).
- Publicize incentive program (public support).
- Conduct a toilet distribution with three distribution points, North, South and East (public opposition) (The County).
- Develop new irrigation schedules for minimizing evapotranspiration (ET) (public support).
- First measure a baseline of current water use for County facilities (public support).
- Retrofit Facilities (public support).
- Develop educational materials (public support).
- Develop conservation goals (public support).
- Publicize County-wide conservation goals (public support).
- Engage with County leadership on the Conservation Plan, message and implementation (public opposition).
- Develop a series of training programs in conjunction with the USDA NRCS for County residents on how to conserve without spending a lot of money, climate-adapted landscaping, and optimal irrigation practices (public support).
- Develop educational materials on the various ground water basins (aquifers) in the County, drought, San Juan Chama impact and other items of interest to County residents (public support).

- Implement ABCWUA ordinances (public opposition).
- Conduct a toilet rebates program with ABCWUA (public support).
- Issue a check to the homebuilder (public support) upon inspection and thus verification of installation of stub-outs for a gray water system (the County)

7.2 ASSESSMENT OF EFFECTIVENESS

Surveys and periodic public meetings can be held to assess changes in public perception and practices as the conservation program is implemented. In order to assist residents, businesses and institutions in assessing changes to conserve water, the County can put in a web page for calculating potential and actual savings. In addition, the following will be addressed in order to assess effectiveness: addressing data gaps and establishing baseline measures.

7.2.1 Addressing Data gaps

An important discovery from the Water Usage Report is that data regarding water use in the County are faulty and missing. The County has some data on water use, but the information does not date back many years. Filling the data gaps will help the County understand how much water is currently being used, and use that as a tool to measure the effectiveness of the Water Conservation Program. The areas with data gaps that need to be filled are as follows:

- Measured use on residential domestic wells
- Domestic well levels (in feet below surface)
- Amount of use by small utilities
- Small utilities' well water levels, conservation initiatives, level of metering, apparent losses and status of infrastructure (real losses)
- Reliability of OSE WATERS database (see section 4, Data Gaps, for more details on this)
- Integration of County data with OSE WATERS database information

7.2.2 Baseline Measures

For the County to measure effectiveness and to answer the question if the County is using less water, it's important to begin with baselines measures in order to compare water use year by year. The areas where a baseline measure of use needs to be set are as follows:

- County facilities' indoor and outdoor use
- Small utilities use
- Mobile home parks use
- Number of people reached in the educational program
- Number of toilets eligible for conversion versus number of toilets replaced
- Number of toilets using greater than 1.6 gpf versus number of toilets converted with kits to decrease use

- Number of water conservation kits distributed and used and additional kits requested
- Existing mandatory measures that address water conservation versus new mandatory measures

8. IMPLEMENTATION PLAN

There are many approaches to water conservation. Bernalillo County can look at a combination of program actions, voluntary measures, and mandatory measures. One option is to introduce voluntary measures initially as a way of encouraging residents and businesses to conserve voluntarily, and as a way of educating County residents on how to conserve. Voluntary measures would include education, incentives and recognition programs. Voluntary measures can be combined with mandatory measures over time. Some mandatory measures can be introduced early on, depending on the probability of acceptance by the public, County staff and the Bernalillo County Commission, as well as the ability to enforce the measures. More mandatory measures may be introduced later in the program, as residents and businesses come to understand how to conserve, and to increase the amount of actual conservation. An additional consideration for the County to evaluate is whether a measure provides permanent savings (as in changing out a toilet) versus other measures that may or may not provide permanent savings (such as education). Outlined in this section are a variety of approaches to conservation measures.

Implementation of the Plan requires the development of a water conservation program. A water conservation program will include setting priorities, coordinating, securing funds, hiring or dedicating staff, and training County staff involved in the implementation of the County Facilities Plan. Public meeting participants indicated support for a Bernalillo County Water Conservation plan, as outlined in Theme 1, "water conservation is important."

The first step for the program is to delegate existing staff and/or hire staff to implement the Water Conservation Plan. Secondly, the County staff should recommend priorities and goals for the program for adoption by the Bernalillo County Commission. Determining priorities and setting goals will require dialogue among County staff and consultation with stakeholders in the County (stakeholder advisory committee development and meeting with business interests in the community). Based on those priorities and goals, County staff can set tactics and strategies, find funds for the new program, develop educational materials, and develop mandatory measures.

County staff took a first cut at setting priorities in the Value Driver Analysis outlined in Section 7.1. The recommendations with top priorities generally have public support. The Value Driver Analysis helped determine recommendations that County staff consider to be of high value and easy to implement. Therefore, the County should put a focus on the following areas: develop educational materials, develop training programs (educational outreach), develop and publicize goals, develop rebates for toilets and gray water systems, and work on achieving conservation in County facilities. The areas where the public meeting participants expressed opposition may still remain priorities as determined by the Value Driver Analysis, but will require more outreach to help the public understand the value and need for engaging County leadership and implementing ABCWUA ordinances.

8.1 METHODS

8.1.1 Bernalillo County as Role Model/Implement County Facilities Plan

Bernalillo County commissioned a Water Conservation Plan in 2004 for its facilities and is beginning to implement that plan. Bernalillo County can take a range of program actions, depending upon the current commitment to conservation by facilities' staff (including maintenance, Parks and Recreation and Water Resources staff) and management. These actions would require educating staff on how to implement conservation measures. The ease of implementation will depend on current attitudes toward and

understanding of conservation within the County. As outlined in Theme 6, "How can Bernalillo County help?" public meeting participants are suspicious of government and prefer collaboration from the County. Some of the fear and suspicion would likely be mitigated by the County taking concrete steps to conserve water in its own facilities before asking County residents or businesses to conserve. Therefore, these easy to achieve measures (low hanging fruit) should be given high priority and would qualify as an early win.

Some of the steps that the County should take to demonstrate good stewardship of scarce water resources are outlined below. Generally, these steps were priorities for the County in the Value Driver Analysis.

1. Measure a baseline of current water use for County facilities. Establishing a baseline of water use for County parks and facilities would require staff time. It is important to confirm that water is being saved by the new measures and to measure the amount. This step requires staff time and development of the baseline information required.

2. Develop new irrigation schedules for minimizing ET. This step requires staff time and development of climate and seasonally appropriate irrigation schedules.

3. Implement water conservation as the default for Parks and Recreation and Facilities Maintenance staff. Examples include education of facilities' maintenance staff to be award of areas such as preventing and reporting leaks and waste, replacing sprinkler heads, and keeping grass slightly taller than typical to minimize ET. This awareness requires staff time, expertise, evaluation of products (i.e., correct sprinkler heads for application), and adoption of policy on grass height.

4. Use conservation in County facilities as educational support by placing ads and other promotional materials to publicize County facilities with xeriscaping as demonstration sites. See Communications Plan for detail on implementation of publicity.

8.1.1.1 Implement Communications Plan

Education is an important factor in affecting the behavioral change required for water conservation. Implementation of the Communications Plan is an important element of a Water Conservation Plan in order to educate County residents and businesses. Elements of the Communication Plan that were a County staff priority (as determined by the Value Driver Analysis and enjoy public support include developing educational materials and publicizing County-wide conservation goals. The importance of education was indicated in several of the themes from the public participation meetings held at the outset of the water conservation planning process. Some of the themes that reiterate the need for a Communications Plan include Theme 1, "we know water conservation is important"; Theme 2, "exploring why water conservation is important"; Theme 4, "we need more education on conservation"; and Theme 7, "a diverse universe;" communicating with the wide range of water users, water sources, and geographic and demographic areas."

The ease of implementation and cost of the Communications Plan varies according to component, as outlined below. Developing materials will be slightly more costly and more complicated, depending upon the graphics capability already at the disposal of the County. Printed educational material can be purchased, from either the ABCWUA or the OSE Water Conservation Program; the costs would vary according to the pieces. Developing workshops for residents will require staff effort and cooperation with other agencies for technical assistance (such as NRCS). However, the workshops will not require a great deal of funding. More expensive components in the Communications Plan, such as radio and television, can be simplified by sharing costs through cooperation with other entities in the region. As such, they may fall into a longer range plan. Theme 8, "water quality" can be addressed by providing workshops and educational materials to domestic well users, including topics such as proper siting, maintenance, closure

procedures, and decreased water use (by limiting water entering a septic system). Publicity and educational materials can be distributed by direct mail using the County database, by small utilities, either in the bills or in newsletters distributed to customers, by local papers and by neighborhood newsletters. The County can capitalize on the Communications Plan for ideas on outreach. After educational materials are developed or purchased by the County, the outreach through direct mail would be the most expensive, while inclusion in existing methods of outreach would decrease the costs.

The Communications Plan can be carried out by staff, depending on internal resources and skills or by a public relations (PR) firm. The following are implementation steps for the Communication Plan:

1. Publicize County-wide conservation goals (developed by County staff) through printed materials, newspaper advertisements and other media.

    a. This step can be developed with either staff time or a PR firm, or a combination thereof.

    b. Publicity would include press releases, published articles, ads in local papers throughout the County, and printed materials such as brochures or newsletters.

    c. Potential venues include mass media, distribution of printed materials via utilities and community water systems, community events, or direct mail.

    d. Press releases, articles, and development of printed materials would require staff time. Ads and mass media would incur costs depending upon the outlet and complexity. In addition, if a PR firm developed any of the above, that would add a cost in addition to the other media costs.

2. Engage with County leadership on the Conservation plan and its message and implementation. This step is important for the success of a water conservation program, and would require County leadership and staff time.

3. Publicize incentive program. Implementation of this step will depend upon the incentives chosen and whether they are new programs or cooperative programs. As outlined in step 1 above, the costs would be dependent upon whether the publicity is implemented solely by the County, in conjunction with the ABCWUA, and/or with contracted assistance.

4. Publicize mandatory measures, including existing requirements for new development, and measures to promote conservation. Implementation of this step will depend upon the measures chosen and whether they are new measures or measures designed for coordination with ABCWUA. In the second round of public meetings, some opposition was expressed to adoption of ABCWUA ordinances, although on an individual ordinance basis, such as restricted time of day watering, the public expressed support. As outlined in step 1 above, the costs would be dependent upon whether the publicity is implemented solely by the County, in conjunction with the ABCWUA, and/or with contracted assistance. There are a range of options with mandatory measures. The first step should be to publicize those measures already in place for the County that govern water use (i.e., Subdivision Code or a new water conservation ordinance). The next step should be to review the ordinances in place that relate to water conservation for the ABCWUA, adapt them for use by the County, and go through the process of review for potential adoption. Finally, reviewing example ordinances recommended in this Plan would require a greater amount of staff time. Any that are useful would go through the review process for potential adoption.

5. Develop a series of training programs in conjunction with the U.S. Department of Agriculture NRCS for County residents on how to conserve without spending a lot of money, climate-adapted

landscaping, and optimal irrigation practices. This activity would primarily require staff time to work with NRCS on the workshops, find locations, and publicize the training programs. Publicity and schedule for the scheduled workshops could take place on the County website at no cost, in newspaper ads for a minor cost, or as direct mail to all County residents, which would be the most costly.

6. Develop a series of training programs to educate domestic well users (37 percent of unincorporated County) about operation, maximum efficiency for wells and long-term supply, protection of water quality, well maintenance, and estimated usage to help them target areas for conservation. This activity would primarily require staff time to find experts to conduct the training, locations, publicity for the training programs. Publicity and schedule for the workshops could take place on the County website at no cost, in newspaper ads for a minor cost, or as direct mail to all County residents, which would be the most costly.

7. Develop educational materials on the various ground water basins (aquifers) in the County, drought, San Juan Chama impact, and other items of interest to County residents. This activity would require staff time and funding for written materials on the subjects. See the Communications Plan for estimated cost for various educational materials. Step 1 above outlines the range of potential options for developing educational materials.

8. Collaborate with agencies in the County for agricultural use conservation education workshops. Collaboration should include the MRGCD, NRCS, New Mexico State University, New Mexico Water Resources Research Institute, MRCOG, and the Cooperative Extension Service. This activity would primarily require staff time to work with entities on the workshops, find locations, and publicize the training programs. Publicity and schedule for the scheduled workshops could take place on the County website at no cost, in newspaper ads for a minor cost, or as direct mail to all County residents, which would be the most costly.

8.1.1.2 Implement ABCWUA ordinances

This area was not specifically recognized in the first round of public participation meetings and received opposing votes in the second round of public meetings. However, County staff counted this as a priority in the Value Driver Analysis, and seven of the specific ordinances received public support. The County needs to be cognizant of a certain resistance to the ABCWUA as identified by public meeting participants, and account for that in educational materials and outreach. Bernalillo County is already a legal part of the ABCWUA; therefore, it is critical that some of the mandatory measures are identical across the board, creating synergy as outlined in the method to measure effectiveness. The components such as the fines, definitions, and time of day restrictions should be identical between the County and the ABCWUA in order not to cause confusion. It should be relatively easy to implement, depending upon the support of the County Commission, and not require funding. It will take staff resources to adapt the appropriate ordinances for County adoption, and time for review of the draft ordinances by the ABCWUA Board and the County Commission.

1. Implementation of Water Waste and Time of Day Watering restrictions. An important part of the water waste and time of day ordinances will be enforcement, which may differ between the County and the ABCWUA. For example, the County should consider requiring a meter for those who have four water waste violations: if the water waster already has a meter, then the normal fine would apply. The measure of a mandatory meter was exceedingly unpopular among the public meeting participants. Although the ordinances could be adopted using existing staff, it is likely that enforcement would incur a cost, whether for new equipment, training, overtime, or other items. The options related to enforcement of these ordinances are outlined below:

a. The County should negotiate with ABCWUA to determine whether County residents can use the existing hotline for reporting violations of the above two ordinances, or set up and staff a hotline.

b. Enforcement can be negotiated with ABCWUA through cost-sharing with existing ABCWUA employees, or the County can use existing County Public Works staff and train them for enforcement. Training with the ABCWUA water waste employees can be negotiated (through revision of the existing Joint Powers Agreement).

c. If the County uses its own staff for enforcement, then the County would have to adapt the vehicle(s), including the addition of equipment such as video cameras for documentation.

d. To issue fines for water waste or time of day violations for non-ABCWUA customers, the County could issue direct bills. Another option for issuing fines is to work with the three major utilities to have them levy fines for water waste violations through the water bills.

e. Implementation of limitations on high water use landscaping. County staff should inspect the landscaping and issue a red tag (requiring landscaping installation work to cease until the requirement is met) if landscaping is not in compliance. If landscaping is not installed when Certificate of Occupancy is issued, County staff should still issue a red tag on the landscaping itself until it meets the requirements.

f. Implement design regulations for conservation and apply to County facilities**,** golf courses**,** and new development in unincorporated area. Bernalillo County would need to review the design regulations.

g. Implement irrigation system standards for existing golf courses, athletic fields, golf courses**,** and new development (excepting single family residential). Bernalillo County would need to review the irrigation system standards.

h. Implement water budgets for County and private golf courses, and to all County-owned parks and athletic fields. Bernalillo County would need to review the water budgets.

8.1.1.3 Other mandatory measures

There are certain mandatory measures that the County should consider in the medium to long term (as they were not determined to be priorities or enjoy public support), which address Theme 9, "we need to control new development." This is an area that will likely be more difficult to implement, because it will require buy-in from stakeholders in the business community (developers) and preferably cooperation with other entities. Some of the difficulty lies in breaking ground, which includes passing mandatory measures for water conservation that are not currently in place. Achieving consensus for all involved in the process of developing and approving mandatory measures is critical. Implementation will be made easier with the commitment and buy-in of the Bernalillo County Commission, a stakeholders advisory committee if one is formed by the County, and education for County residents and businesses on the benefits of the ordinance. Although the County cannot address population growth and new housing directly, some mandatory measures can be implemented to maximize conservation efficiency and to limit the number of new domestic wells drilled. This would have the additional benefit of addressing Theme 8, "water quality." These measures may not be easy to implement, depending upon the support of the County Commission and the response of County stakeholders. These will not require new funding. It will take staff resources to adapt the appropriate ordinances for County adoption, and time for review of the draft ordinances by the ABCWUA Board and the Bernalillo County Commission.

- Implementation of an ordinance requiring retrofit on resale or remodel**.** For the remodel portion, the requirement for low-flow devices would be added to a permit required for plumbing retrofit. Retrofit upon resale could be added as a requirement for a title transfer and verified as part of an inspection. Both of these would be better done on a County-wide basis or a regional basis. Implementation would require staff time and major effort to work with title companies. The resale portion of this ordinance would be more complicated because it's an area where the County doesn't have direct jurisdiction. In addition, this measure was unpopular with the public meeting participants; therefore, the County would need to work to develop understanding and acceptance of this measure.

8.2 AUDIENCES

8.2.1 Outreach to small utilities

Smaller utilities provide an opportunity for the County to reach County residents and an opportunity to promote water conservation. Outreach to smaller utilities can take place in a number of ways, and can be phased in over time, as it was not identified as a priority through the Value Driver Analysis, or as an area of great public passion (neither strong support nor strong opposition). Through closer ties to smaller systems, the County can help improve standard practice by support and assistance. An added benefit is that the County can continue to acquire better information on the rate of water usage within the County and the practices and preferences of County residents. Implementation will require County staff time to develop relationships with the small utilities and community water systems.

1. Bernalillo County should survey the small utilities and community water systems to describe existing conservation measures, training required to improve conservation, accounting methods, level of metering for individual accounts, rates, and other charges. Information on all of these areas will assist the systems and the County in addressing areas where conservation can take place or be improved.

2. Bernalillo County should develop relationships with the various systems and utilities to promote conservation and identify ways to reach residents that are non-ABCWUA utility customers. This can happen in two ways: by meeting with the managers of the utilities and by promoting participation in the New Mexico Rural Water Association **(**NMRWA**)** by all utilities through an incentive program and a Bernalillo County "chapter" within the larger organization.

3. One option, based on the information gathered in the surveys, is for the County to review the accounting systems used and work with the individual systems to improve information gathering, water accounting**,** and leak detection (for systems and for individual accounts).

4. Another option for improving information gathering is to choose a uniform accounting software system for the smaller utilities in Bernalillo County (less than 1,000 connections) that would track water rates and usage, perform reporting and billing, and promote its use among all of the small utilities within the County in order to improve water accounting and information gathering. Given the range of level of metering and accounting systems, this may be a difficult measure.

5. Bernalillo County can subsidize metering for all (non-ABCWUA) utility customers that are not metered, either through new program funds or by writing grants with the small systems for metering individual accounts.

6. Bernalillo County should utilize NMRWA and the Rural Community Assistance Corporation (RCAC) to address the most relevant conservation issues for the water system. The needs for the technical workshops can be determined through the survey mentioned above. Because these

organizations regularly provide this type of training, the process would require adaptation for Bernalillo County to provide uniformity and identify participants.

8.2.1.1 Implement residential measures

Theme 3, "we're already conserving," indicates that public meeting participants are, for the most part, aware of and practicing water conservation. However, there are certain areas where the public may not be actively engaged, such as water harvesting and xeriscaping. Incentives and voluntary measures are more complicated and costly to implement. These measures are an important part of a conservation program, engaging the public and providing education in the tools needed to conserve water. Incentive programs will likely be a combination of new programs implemented only by the County and negotiating those programs that could be shared with the ABCWUA in some way. The incentive programs will also require new sources of funding, staff time and political support.

Replacement of toilets is emphasized because toilets consume the largest amount of water indoors, and replacement is a voluntary measure that enjoyed public support for implementation with ABCWUA. In addition, toilet replacement provides a larger amount of savings for less cost to the County. Toilet rebates should be targeted at homes that are older than 1995 and not likely to have been remodeled. In Bernalillo County, there are approximately 28,000 homes that may need a retrofit[27]. By 2008, approximately 1,000 homes in the South Valley will be eligible to connect to the ABCWUA for water service. The water customers in these homes can be targeted for a free audit for water-saving changes and toilet replacements. For all of the toilet replacement options, the County would reserve the right to inspect a resident's home to verify that the toilet was changed out. A range of options for implementing toilet replacements in the County are outlined below.

1. Bernalillo County could develop a rebate program for the County residents not eligible for rebates (i.e., those residents that are not water customers of the ABCWUA). The toilets could be purchased in bulk, for installation by plumbers on contract with the County. The rebate program could begin with participants in the PIPE and housing rehabilitation program.

2. An alternative to installation would be for the County to negotiate with retail and plumbing supply outlets to accept a County-issued coupon for an instant rebate at the register. The County would develop an application and set of performance criteria for the eligible toilets, process applications for the coupon, and issue coupons to residents.

3. Another option for replacement of high-flow toilets with low-flow toilets, in lieu of or in addition to a toilet rebate program, is to conduct a toilet distribution with three distribution points, North, South, and East. The toilet distribution program would help low income County residents who otherwise might not retrofit given the financial barriers, including upfront investment required to participate in a rebate program. One option for a toilet giveaway is coordination with community groups to identify potential participants, that is, County residents that are homeowners whose homes were built prior to 1995 and who are elderly, infirm, or unable to afford the upfront cost of a toilet. The community groups would provide volunteer plumbers, while the County would provide the toilets.

4. Another option is a one-day event at a public outdoor venue. The County would publicize the event and provide a given number of toilets for County homeowners. Anybody who picked up a

[27] 1995 was the year that 1.6 gpf toilets became commonplace in new homes, although the change to the Uniform Plumbing Code took place in 1990.

toilet would be required to bring the old toilets back two weeks later for demolition[28]. If the toilet(s) are not returned, the County should assess the homeowner for the cost of the toilet(s) on their property tax bill[29].

5. Bernalillo County could coordinate the rebate program with ABCWUA. Bernalillo County should negotiate the terms of the level of coordination of the rebate program. If feasible, the ABCWUA could process applications for the toilet and high-efficiency washing machine rebate programs, with a cost per rebate to be reimbursed by the County. In the long term, the County can negotiate with the other three large utilities to issue County-funded rebates via utility bills.

8.2.1.2 Implement commercial and institutional measures

Measures to help conserve water in new development and existing businesses and institutions will require the County to work closely with stakeholders. Despite the difficulty, this area is important because it will achieve conservation and address County resident preferences indicated in Theme 9 from the public meetings. The range of options includes incentives and mandatory measures.

1. Implementing requirements for new development to have a zero footprint might be more politically difficult, and should probably be developed in conjunction with the ABCWUA and the Homebuilders Association. There are a variety of directions for this, ranging from a monetary contribution to the conservation program to offset the impact of each new home, to outright purchase of low-flow toilets for retrofitting older toilets by commercial homebuilders. This would require a range of administration by the County. There is public support for some form of this measure.

2. Require conservation measures for homes over a certain size, starting at 2,500 or 3,000 square feet. There was public support for measures for homes over 3,000 square feet.

3. Establish a five-tier system for water smart homes, allowing commercial homebuilders to use it as a promotion, and then recognizing homebuilders for the number of water smart homes they sell. Factors to be included in the five-tier system include low-water use dishwashers, high-efficiency washing machines, high-quality toilet (some of the low-end toilets do not flush properly or develop leaks quickly) rain water harvesting systems, and permaculture features in landscaping. There is public support for this measure.

4. Establish conservation budgets for new homes and place the burden on the developer to demonstrate how they intend to meet the established goal. ABCWUA is using this concept with Mesa del Sol.

5. Promote gray water systems in the form of incentives or mandatory measures. If required of new development, the range could include all single family homes, or only those built by commercial homebuilders. In either case, inspection to verify the use of gray water would be carried out by Bernalillo County Building, Planning and Zoning. If the program were an incentive, upon inspection and thus verification of installation of stub-outs for a gray water system, the County would issue a check to the homebuilder. There is public support for incentives for gray water

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[28] Both Albuquerque and Rio Rancho set up programs to destroy and re-use the old toilets as aggregate for road construction.

[29] Any proceeds would be folded back to fund the water conservation program.

systems. If an actual gray water system were installed, a permit should be required so that Bernalillo County Building, Planning and Zoning can verify that the system is properly designed and installed to protect the water supply system and the health and safety standards in the new home.

6. For existing businesses and institutions, the County could create a recognition program for measures that save water. Recognition could range from a published thank you on the County website (with the potential for creating a conservation page); a thank you for the measures taken published in a newsletter; decals that the business or institution could place in the window; collaboration with Chamber of Commerce for recognition; or a formal recognition dinner. In terms of requiring businesses and institutions to change out toilets by a certain date**,** if the change-out does not occur, the County could send a letter requesting the change, or potentially take stronger measures, since it would be required by ordinance, such as assessing a fine for every month that the change-out is past due.

8.2.1.3 Phased Implementation

Some of the measures that the County ranked as priorities according to the Value Driver Analysis were opposed by public meeting participants. In the case of joint incentive programs with ABCWUA, those can be reviewed for possible inclusion in the program at a later date. In the case of other areas, such as reviewing conservation ordinances in place for ABCWUA, those will be pursued in Phase I, but will clearly require extra emphasis in the educational outreach in order to win public support. Tables 3 through 5 list the Phase I, II, and III conservation measures and identify them as a program action (P), voluntary action (V), or mandatory action (M).

Phase I measures should be evaluated as they are implemented, and expanded or eliminated as appropriate. Therefore, some Phase I measures may be repeated in Phase II. Programs involving ABCWUA were opposed by public meeting participants; therefore, public opinion will need to be measured after an education campaign before integrating joint incentive programs with ABCWUA.

Table 3. Phase I Conservation Measures

Category	Phase I Conservation Measures
P	Engage with County leadership on Conservation plan, message and implementation.
P	Develop a baseline of current water use for County facilities.
P	Retrofit County Facilities (indoor fixtures).
P	Develop new irrigation schedules for minimizing evapotranspiration (ET) for County facilities.
P	Develops conservation goals (set percent goals for individuals, households and businesses) (County)
P	Publicize County-wide conservation goals.
V	Promote voluntary reporting of consumption data for metered domestic wells.
V	Develop educational materials.
V	Develop a series of training programs in conjunction with the U.S. Department of Agriculture NRCS for County residents on how to conserve without spending a lot of money, climate-adapted landscaping, and optimal irrigation practices.

Category	Phase I Conservation Measures
V	Develop educational materials on the various ground water basins (aquifers) in the County, drought, San Juan Chama impact and other items of interest to County residents.
V	Develop educational materials for agricultural users (including ideas such as laser level, ditch lining and potential for less water intensive crops, and promoting agricultural users to seek out and use existing funding support for water conservation).
P	Publicize existing requirements for new development, as well as measures put in to promote conservation.
V	Publicize incentive program.
V	Develop and implement toilet replacement incentive program for unincorporated Bernalillo County.
V	Develop rebate and incentive program for Partners in Improving and Protecting the Environment (PIPE) program participants.
V	Provide incentives for installation of stub-outs for a gray water system
V	Leak detection audits for small utilities' customers (provide audits at customer request)
M	Review the ordinances in place that relate to water conservation for the ABCWUA, adapt them for use by the County, and go through the process of review for potential adoption.
M	Implement ABCWUA ordinances (opposed by public meeting participants).
M	Implement time of day restrictions.
M	Implement water waste ordinance.
M	Implement design regulations for conservation that apply to County facilities and new golf courses.

P = program action; V = voluntary action; M = mandatory action

Table 4. Phase II Conservation Measures

Category	Phase II Conservation Measures
P	County facility repair and maintenance to look at areas such as preventing leaks, replacing sprinkler heads and keeping grass slightly taller to minimize ET.
P	The County should survey the small utilities and community water systems to describe existing conservation measures, training required to improve conservation, the accounting methods, level of metering for individual accounts, rates, and other charges.
P	The County should develop relationships with the various systems and utilities to promote conservation and identify ways to reach residents that are non-ABCWUA utility customers.
V	The County should sponsor technical workshops with the assistance of the New Mexico Rural Water Association (NMRWA) and the Rural Community Assistance Corporation (RCAC) (one set geared for small utilities and the other for community water systems) to address the issues most relevant for the water system.

Category	Phase II Conservation Measures
V	Establish a five-tier system for water smart homes, allowing commercial homebuilders to use it as a promotion, and then recognizing homebuilders for the number of water smart homes they sell.
V	For existing businesses, the County could establish a recognition program for businesses that take measures to save water.
V	Assist mobile home parks in submetering (education or incentives).
V	Implement an outdoor rebate program for new development – rainwater harvesting system.
V	Implement an outdoor rebate program for new development – irrigation efficiency.
V	Implement an outdoor rebate program for new development – cistern.
V	Implement an outdoor rebate program for new development – water conserving site design.
V	Implement an outdoor/indoor rebate program for new development – re-use and treat water (system).
M	Implement irrigation system standards for existing golf courses, athletic fields, golf courses and new development (excepting single family residential).
M	Implement water budgets for County and private golf courses, and for all County-owned parks and athletic fields.

P = program action; V = voluntary action; M = mandatory action

Table 5. Phase III Conservation Measures

Category	Phase III Conservation Measures
P	Xeriscape at County facilities to serve as demonstration sites as educational support.
P	Work with the individual systems to improve information gathering, water accounting and leak detection (for systems and for individual accounts).
V	Subsidize metering for all (non-ABCWUA) utility customers that are not metered, either through new program funds, or by writing grants with the small systems for metering individual accounts.
V	Assist smaller utilities in meter testing and repair (education).
V	Assist smaller utilities in determining amount of non-revenue water (education).
V	Assist smaller utilities in tracking spikes and anomalies (education).
V	Conduct audits for residential Bernalillo County (opposed by public meeting participants).
M	Require conservation measures for homes over a certain size, starting at 2,500 square feet. (Opposed by public meeting participants. County will defer to next size.)
M	Require more stringent conservation measures for homes over 3,000 square feet.
M	Promoting gray water systems through mandatory measures. (Opposed by public meeting participants.)

P = program action; V = voluntary action; M = mandatory action

Program implementation will depend upon budget and staffing allocation by the County. As the Program is implemented, the County should conduct an annual review of the budget, the Water Conservation Plan, and any recommendations not yet implemented; update data; review goals; and set any new goals as appropriate. After a period of five years, the County should consider a substantial review and updating of the Water Conservation Plan and Program in order to keep up with changing technology and external factors such as drought.

9. FUNDING SOURCES

Four main sources of funding are available for the Bernalillo County Water Conservation Plan. These sources can be used to directly support County programs or to promote conservation for the utilities or community water systems. One source is state funds that are in place to support water conservation throughout the State, such as money from the Legislature. State Legislature money can be obtained by asking a member of the Legislature to sponsor a bill containing funding for a conservation program. If obtained, the State would set up a grant agreement with the County. The benefit of Legislature funding is that it can provide substantial support. The downside is that it is generally a one-time allocation, and future funding would have to be requested annually, with no guarantee of passing. Currently, the Water Trust Board, another potential source of state funding, does not fund outreach activities. However, the County may want to pursue other sources of state funding or grants, such as through the Department of Finance and Administration.

A second source is the typical budget requests from existing Bernalillo County sources, primarily the environmental services gross receipts tax (ESGRT). There is often fierce competition for these funding sources, and the funding may be difficult to allocate on a recurring basis, thus requiring the program to request the funding each year, with no guarantee of having the program funded.

A third source is General Obligation Bonds, which have low interest rates and a 20-year payback. The disadvantage is that the County would have to pay interest on a program that does not yield monetary benefits. In addition, it is difficult to get a General Obligation Bond passed as voters are often reluctant to add to the property tax burden.

A fourth source is Federal grants through the U.S. Environmental Protection Agency (EPA), BOR or NRCS. The BOR 2025 Program and the Field Services Water Conservation Program have water conservation grants. There is fierce competition for the Field Services Water Conservation Program, which has been steadily decreasing the overall allocation from BOR. The EPA administers a Section 319 grant program through the New Mexico Environment Department for watershed protection, so the program may not qualify. For agricultural conservation by the County, the NRCS has two funding programs under the Conservation Innovation Grant: state level and national level. The grants require a 50 percent split of costs by recipient. Main areas of focus include irrigation management.

A fifth source is monies generated by the Water Conservation Program itself. Money could potentially come from one of two sources: fines levied on water waste violations that can be used to contribute to the budget for a conservation program and developer fees, such as those collected through a zero footprint requirement for new development. However, because fines are unlikely to be a significant source of funds, they cannot be counted on as a primary source of funding.

In addition, the County could apply for grants through foundations. Grant-writing for foundations is a rather specific skill set that requires time to master; therefore, it may not be practical for the County. Grants are competitive, and grant money cannot be used for long-range planning, as the money cannot be relied upon until granted.

10. METHODOLOGY FOR ECONOMIC INCENTIVES AND MANDATORY MEASURES

The methodology to evaluate economic incentives and mandatory measures included the following approaches:

- Identification of significant programs within and outside of New Mexico
- Collection and review of policies, programs, outcomes, issues, and reports from a wide variety of water conservation programs
- Interviews with key individuals about the success of their programs to discuss what worked and what didn't, the processes they used, how they measured effectiveness, the target audience for the program, and any other information available.
- Review of information and documents online.

After all of the information was reviewed, the programs and policies were reviewed for applicability for the County. Based on the review, some of the approaches are recommended for County consideration, and are outlined in the preceding pages.

The following programs and/or entities were reviewed:

1. California Urban Water Conservation Council
2. City of San Antonio, Texas
3. City of Austin, Texas
4. City of San Marcos, Texas
5. Houston-Bay Area Subsidence District
6. Carol Baker, Lobbyist
7. Texas Water Development Board
8. City of Denver, Colorado
9. City of Boulder, Colorado
10. City of Aurora, Colorado
11. City of Durango, Colorado
12. City of Seattle, Washington
13. City of Portland, Oregon
14. Southern Nevada Water Authority
15. City of San Diego, California
16. City of Oakland, California
17. City of Los Angeles, California
18. City of Phoenix, Arizona
19. City of Tucson, Arizona

20. City of Gilbert, Arizona
21. City of Mesa, Arizona
22. State of Arizona Water Resources Department
23. State of New Mexico Office of the State Engineer
24. Bernalillo County
25. City of Albuquerque
26. Albuquerque Bernalillo County Water Utility Authority
27. State of Washington
28. State of Colorado
29. State of Utah
30. City of Atlanta
31. National Association of Counties
32. New Mexico Rural Water Association
33. Rural Community Assistance Corporation
34. Bernalillo County Cooperative Extension Service
35. City of Cabria, California
36. Chris Brown, independent consultant, San Antonio, Texas

11. BIBLIOGRAPHY

Albuquerque Building Code. 2004. http://www.cabq.gov/planning/publications/documents/chapter44.pdf accessed 12/16/2005.

American Water Works Association, 2005. http://www.awwa.org/waterwiser/waterloss, accessed 10/31/05.

City of Albuquerque. 2005. http://www.cabq.gov/waterconservation/insert.html, accessed 8/05.

City of Tucson, AZ. 2005. http://www.ci.tucson.az.us/water/ordinances.htm. accessed 8/05.

Bureau of Reclamation (BOR). 1997. Middle Rio Grande Water Assessment. Final Report; Land Use Trends and Their Effect on Water Use and the Hydrologic Budget in the Albuquerque Basin, New Mexico, Supporting Document Number 14; Middle Rio Grande Basin Surface Water Budget for Calendar Years 1935, 1955, 1975 and 1993, Supporting Document Number 15; Canal Seepage Field Investigations, Supporting Document Number 12.

Mid-Region Council of Governments (MRCOG). Bernalillo County demographic information. 2005. http://www.mrcog-nm.gov/Bernalillo_County.htm, accessed 12/11/2005.

New Mexico Office of the State Engineer (OSE). A Water Conservation Guide for Public Utilities. 2001.

Robert, Lisa. Middle Rio Grande Ecosystem Bosque Biological Management Plan ~ The First Decade: A Review & Update (BBMP). Middle Rio Grande Bosque Initiative, June 2005.

Sandoval County Planning & Zoning. Sandoval County Land Subdivision Regulations. July 21, 2003.

Strech, Doug. 2005. Electronic mail from Doug Strech, GIS Coordinator, Middle Rio Grande Conservancy District, to Colleen Logan, Weston Solutions, Inc. June 15.

US Census Bureau, Population Estimates, 2005. http://www.unm.edu/~bber/demo/citypopest4.htm. accessed 11/16/05accessed 11/16/05.

US Census Bureau, Bernalillo County information, 2005. http://quickfacts.census.gov/qfd/states/35/35001.html, accessed 12/11/2005.

U.S. Environmental Protection Agency (EPA), 2006. http://www.epa.gov/OW/you/chap3.html accessed 1/16/2006.

Vickers, Amy. 2001. Handbook of Water Use and Conservation. Amherst, MA: WaterPlow Press.

Water Administration Technical Engineering Resource System (WATERS) Database, New Mexico Office of the State Engineer, as of December 27, 2004.

Zoning, Building, Planning and Environmental Health Department. Bernalillo County Code Subdivisions. June 28, 2005.

Weber Basin Water Conservancy District. 2005. http://www.weberbasin.com/conservation/related.php. accessed 8/05.

South Florida Water Management District. 2005. http://www.sfwmd.gov/org/wsd/wsp/wcm.htm. http://www.sfwmd.gov/curre/watshort/index_tips.htm. accessed 8/05.

Texas Water Resources Education. 2005. http://texaswater.tamu.edu/conservation.riogrande.html. accessed 8/05.

The University of North Carolina at Chapel Hill. 2005. http://www.unc.edu/depts/pubserv/savewater. accessed 8/05.

Town of Cary, 2005. http://www.townofcary.org/depts/pwdept. accessed 8/05. water/waterconservation/overview.htm, accessed 8/05.

Colorado Department of Local Affairs. 2005. http://www.dola.state.co.us/drought/ordinances.htm. accessed 8/05.

Moscow, ID, 2005. http://www.ci.moscow.id.us/SpecialTopics/Ordinances/ water1.pdfwww.ci.moscow.id.us/SpecialTopics/Ordinances/water1.pdf, accessed 8/05.

Dallas, TX. 2005. http://www.dallascityhall.com/dallas/ eng/html/conservation. accessed 8/05.

Gilbert, AZ. 2005. http://www.ci.gilbert.az.us/ordinances/waterconservation.cfm. accessed 8/05.

Vista Irrigation District, Vista, CA. http://www.vid-h2o.org/conservation/waterstage.asp. accessed 8/05.

El Paso Water Utility – Public Services Board, 2005. http://www.epwu.org/conservation/ordinance.html. accessed 8/05.

City of Lodi, CA, 2005. http://www.lodi.gov/public_works/body_water_ord.html. accessed 8/05.

Santa Cruz, 2005. http://www.ci.santa-cruz.ca.us/wt/wtcon/landscapeord.htm. accessed 8/05.

Environment Council of Rhode Island, 2005. http://www.environmentcouncilri.org/water_conservation.html. accessed 8/05.

Santa Monica, CA, 2005. http://santa-monica.org/services/choc/404.htm. accessed 8/05.

Escondido, CA. 2005. http://www.ci.escondido.ca.us/depts/pw/utilities/conservation. accessed 8/05.

University of California Riverside, Turfgrass Research Facility. 2005. http://ucrturf.ucr.edu/Links/ab325.htm. accessed 8/05.

City of Hawarden, Iowa, 2005. http://www.cityofhawarden.com/Gov/Ord/02/Ordinance605.html. accessed 8/05.

BexarMet Water Efficiency Department, TX, 2005. http://www.bexarmet.org/SAordinance/ordinance_main-content.htm. accessed 8/05.

Incline Village General Improvement District, NV, 2005. http://www.ivgid.org/newsite/ PublicWorks/Ordinances/ORD_land. accessed 8/05.

Town of Apex, NC, 2005. http://www.apexnc.org/depts/pw/water_cons.cfm. accessed 8/05.

City of Bellingham, WA, 2005. http://www.cob.org/pw/water.htm. accessed 8/05.

City of Rio Rancho, 2005. http://www.ci.rio-rancho.nm.us/ RRUTL/WaterConservationOrdinance.htm. accessed 8/05.

City of Alamogordo, 2005. http://ci.alamogordo.nm.us/CA/CA020.htm. accessed 8/05.

Tempe, AZ. 2005. http://www.tempe.gov/water/conserve.htm. accessed 8/05.

Paulding County Government, GA. 2005. http://www.paulding.gov/living/waterdepartment.asp. accessed 8/05.

Columbia County, WI. 2005. http://www.co.columbia.wi.us/dept/lwcd. accessed 8/05.

City of Santa Fe. 2005. http://www.co.santa-fe.nm.us/departments/ land_use/water_harvesting. accessed 8/05.

US Water News. 2005. http://www.uswaternews.com/archives/arcconserv/arcconserv.htm. accessed 8/05.

Municipal Research & Services Center of Washington. 2005. http://www.mrsc.org/Subjects/ Environment/water/wc-measures.aspx. accessed 8/05.

County of San Diego, CA. 2005. http://www.sdcounty.ca.gov/dplu/ Resource/3~procguid/3~procguid.html. accessed 8/05.

Pima County, AZ. 2005. http://www.ag.arizona.edu/AZWATER/ publications/conservation/conserve.pdf. accessed 8/05.

California Urban Water Conservation Council, 2005. http://www.cuwcc.org. accessed 8/05.

Southern Nevada Water Authority. 2005. http://www.snwa.com. accessed 8/05.

Saving Water Partnership Seattle and Participating Area Water Utilities. 2005. http://www.savingwater.org. accessed 8/05.

Resource Venture, Seattle, WA. 2005. http://www.resourceventure.org/rv/issues/water/get-started/index.php. accessed 8/05.

http://www.waterreuse.org. accessed 8/05.

Austin, 2005. http://www.ci.austin.tx.us/watercon. accessed 8/05.

Texas Water Development Board. 2005. http://www.twdb.state.tx.us/assistance/conservation/taskforce.asp. accessed 8/05.

Denver, 2005. http://www.denverwater.org. accessed 8/05.