ATechnical and Physical Feasibility Fact Sheet

Alternative 18: Urban Conservation

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1. Definition of Alternative

A-18: Adopt and implement local water conservation plans and programs in all municipal and county jurisdictions, including drought contingency plans.

The first part of this alternative, "adopt and implement local water conservation plans and programs. . ." is covered in Sections 2 through 3, below. Drought contingency plans are covered in Section 4.

2. *Part I. Adopt and Implement Local Water Conservation Plans/Programs*

Summary of the Alternative Analysis

Important Note: *Water use and savings estimates in this analysis (summarized in Tables 18-2 and 18-3) reflect a very high level of conservation—a "best case" conservation scenario. Savings estimates are based on a complete implementation, phased in over 20 years, of major conservation measures leading to significantly reduced water usage rates (see Table 18-1). Outdoor conservation goals are based on recommended subdivision guidelines from the Office' of the State Engineer (OSE) , which assume a major reduction of irrigated landscape area to a maximum area of 800 square feet per residential unit for new construction and phased in reduction for existing residential landscapes. Indoor savings are based on national case studies of a conserving home with conserving appliances and lifestyle. If these goals are not reached, water savings will be significantly lower than the estimates shown in Tables 18-3 and 18-4. As such, the numbers presented in Tables 18-3 and 18-4 should be treated as a best-case scenario for conservation and not treated as a forecast about future water use and savings in any conservation scenario. A significant financial, lifestyle and political investment is needed to achieve these savings. If conservation levels are lower than the best case effort scenario, the water savings figures must be decreased accordingly.*

The analysis of this alternative draws on water conservation plans and data found in a variety of implemented programs, publications, and case studies. Sources include Office of the State Engineer Technical Reports (Morrison, 2000; NM OSE, 2001; Wilson, 1997), a textbook by

Vickers (2001), the water conservation programs and associated activities developed and implemented by the City of Albuquerque and other jurisdictions in the region (City of Albuquerque, 2002a; Witherspoon, 2002a; NM OSE, 2001), water use data in a report commissioned for this water planning region (JSAI, 2000) Mid-Region Council of Governments (MRCOG) planning documents (MRGCOG, 2000 and 2002) and ideas on these alternatives documented by MRCOG and the Water Assembly.

Water uses analyzed in this section are non-agricultural. Agricultural water use alternatives are covered in A-7, A-9, A10, A-40, and A-60.

Estimates of potential conservation savings are calculated based on current water use in the Middle Rio Grande (MRG) water planning region and shown in Table 18A-1 (*Estimated Current Water Use by Public Water Supplies and Domestic Wells in Bernalillo, Sandoval, and Valencia Counties*) in Exhibit 18A. As Albuquerque water customers use approximately 74 percent of the planning region's municipal, residential, industrial and commercial water, attention to conservation efforts in Albuquerque can yield the most savings.

To project potential conservation savings, goals were established for reduced per capita use, as shown in Table 18-1. Water use is characterized in gallons per capita per day (gpcd), derived by dividing the total water pumped/withdrawn per year (in gallons) by population, then dividing the quotient by 365 days. This method allows for a comparable index to be developed when only total water delivered and population data are available. Total water use includes usage by residential, commercial, industrial, and institutional customer classes, as well as unaccounted-for-water (UAW). The usage goal assumes installation of water conserving devices and landscape and water-conserving lifestyle changes.

A residential-only usage (gpcd) is estimated. Monitoring of actual usage is possible if enough data is available to extract all other uses (i.e., industrial, municipal, and commercial) and to examine the differences between winter and summer use so that outdoor and indoor use can be determined. The established goals are based on estimated indoor usage for a "conserving home" and outdoor usage for a home with a landscape of 800 square feet, using drip irrigation. For further detail, see Table 18A-2 (*Estimate of Gallons per Person per Day Before and After Proposed Water Conservation Measures Implemented and Reduction from Current Use*) and

Table 18A-3 (*Estimated Savings and Costs Attributed to Installation of Water Conserving Fixtures and Appliances*) in Exhibit 18A.

Table 18-1. Proposed Conservation Goals for the Middle Rio Grande Regional Planning Area

Year	Public Water System Usage (gpcd)					
	Composite Usage			Residential-Only Usage		
	Total	Indoor [a]	Outdoor [b]	Total	Indoor [a]	Outdoor [b]
2000	200 [c]	120	80	104	62	42
2010	160	96	64	81	51	30
2020	135	80	55	68	48	20
2050	120	80	40	65	45	20

[a] Indoor water use goals are based on water use in a "conserving" house with water-efficient fixtures and appliances (Vickers, 2001)
[b] Outdoor water use goals are based on reduced landscape area and watering rates (Wilson, 2002a and 2002b)
[c] The estimated gallons per day (gpd) is generalized to provide a starting point. Some locations may have already achieved a lower gpd.

gpcd = Gallons per capita per day

To reach target per capita use rates, various conservation measures were analyzed. In order to target the highest uses, water use was analyzed to establish where conservation can make the biggest difference. Target water uses included residential outdoor, residential indoor, and large irrigated green spaces (e.g. golf courses, parks, and medians).

Estimates of potential savings resulting from reduced per capita use were calculated. The Sandia National Laboratories computerized water model ran conservation scenarios for the low and high population projections through 2050. Results are shown Table 18-2. The model offers the ability to calculate potential savings using other assumptions and variables.

3. Alternative Evaluation

3.1 Technical Feasibility

Enabling New Technologies and Status

Water-conserving technologies for indoor and outdoor uses are available in the current market. Within the 50-year timeframe of this regional water plan, new technologies for fixtures, appliances, and irrigation systems will potentially increase water use efficiency.

Water savings attributed to conservation presented in this analysis result from a coordinated, concentrated effort to implement conservation measures. Reduced efforts will yield results lower than the saving estimates discussed under Section 3.1.1, *Physical and Hydrological Impacts*.

Outdoor Water Use. Water conserving guidelines based on the subdivision guidelines issued by the NM OSE (Wilson, 2002a) set a ”low-water-use” scenario for landscaping. Guidelines include reducing irrigated landscape areas to 800 square feet and reducing watering levels to 0.5 acre-feet per year per lot. Low water use plants and drip irrigation is encouraged.

Even if phased in over ten years, water savings can be very significant. Reducing the size of irrigated residential landscapes from the current averages of 3,500 square feet (Albuquerque), 1,700 square feet (Rio Rancho), and 1,500 square feet (semi-urban areas in other parts of the region) can save an estimated 34,000 to 74,000 acre-feet per year (Tables 18-3, 18A-4, and 18-A-6 *[Estimated Water Savings from Reducing the Size, Plantings and Water Rate for Residential Landscapes After 100% Implementation of OSE Conservation Subdivision Guidelines* in Exhibit 18A]). Table 18-3 presents a "best possible outcome" for conservation rather than a conservative estimate, as discussed at the October 26, 2002 meeting that reviewed the assumptions for this alternative.)

Indoor Water Use. Assumptions of savings attributed to water-conserving measures and the 45 gpcd goal for indoor use are based on the "conserving house" as described in case studies reported by Vickers (2001). Savings from fixture replacement are summarized in Table 18A-3 (*Estimated Savings and Costs Attributed to Installation of Water Conserving Fixtures and Appliances*) in Exhibit 18A.

Infrastructure Development Requirements

Repair, rehabilitation, and ongoing maintenance of existing water-related infrastructure are essential to achieve and maintain water conservation goals. UAW losses are directly related to the rehabilitation and repair of water and sewer lines. To reduce UAW losses, a significant investment (up to $20 million/year for Albuquerque alone) is needed to repair and rehabilitate water infrastructure. Irrigation systems would need to be converted from sprinklers to drip on a landscape-by-landscape basis at an estimated cost of $2.00 per square foot.

Total Time to Implement

The time needed to implement water conservation is contingent on the commitment of the public and elected officials and the financial resources available. A significant reduction of water use can be achieved in 10 to 20 years if conservation measures are implemented in a timely manner and water consumers and providers subscribe to the effort. Fostering implementation requires commitment to ongoing publicity, education, and other programs to maintain a high level of awareness and participation in conservation activities.

3.1.1 Physical and Hydrological Impacts

Effect on Water Demand

Conservation can effectively reduce the demand for water on a regional basis. Tables 18-2 and 18-3 summarize the estimated water use and savings associated with reduced per capita water use. Even though population is projected to grow, conservation can lead to significant savings in water use.

Table 18-2 summarizes water use and savings as conservation efforts increase based on population forecasts. Projected water use and conservation-based savings were computed using the Sandia National Laboratories water model. This computer model assumes that the target gpcd levels shown in Table 18-1 are achieved. Results show that if significant indoor and outdoor conservation measures are fully implemented (i.e., phased in over 10 to 20 years), total annual water demand for an increased population can resemble current demand levels. However, if the region grows at the highest projected rate, between 2020 and 2050 water demand will surpass 2000 levels by an estimated 26 percent. Note that a key element in achieving these savings is the large reduction of landscape area and high-water-use plants and turf. The savings projected in Tables 18-2 and 18-3 will be achieved only if these reduction measures are fully incorporated into policy and practice.

As stated in the introductory note in Section 2, *Summary of the Alternative Analysis,* the numbers presented in Tables 18-2, 18-3, and 18-4 (see Part II) should be treated as a best-case scenario for conservation and not as forecasts for future water use and savings in any conservation scenario. A significant financial, lifestyle, and political investment is needed to achieve these savings. If conservation levels are lower than the best case effort scenario, the water savings figures must be decreased accordingly.

Table 18-3. Estimated Water Use and Savings in the Middle Rio Grande Planning Region

	Population [a]		Water Usage [b] (acre-feet)		Water Savings [c]	
	Low Projection	High Projection	Low Projection	High Projection	Low Projection	High Projection
2000	725,114	NA	158,890	NA	NA	NA
2010	829,434	892,000	146,432	156,475	148,697	155,143
2020	939,606	1,005,364	139,507	156,173	109,390	120,284
2050	1,150,331	1,500,000	154,331	200,263	238,351	292,211

[a] Population projections are based on MRGCOG (2000), which uses forecasts from the University of New Mexico Bureau of Business and Economic Research (BBER) and the Regional Economic Models, Inc. (REMI) model calibrated by REMI for State Planning and Development District 3 (SPDD3).
[b] Calculations were based on rates provided in Table 18-1 and combinations of data sources cited throughout this document.
[c] Savings is calculated using a baseline of 2000. Return flow is based on rates provided in John Shomaker & Associates, Inc. (JSAI) (2000), Tables 21 and 29.

NA = Not applicable

Effect on Water Supply (surface and ground water)

Conservation could ease the pressure on limited water supplies.

Water Saved/Lost (consumption and depletions)

Table 18-2 provides estimates of water use, savings, and return flow between 2000 and 2050 using the MRCOG "low" and "high" population projections. Water use, savings, and return flow are shown by end-use categories (proportional use by end-use category is based on rates in John Shomaker & Associates, Inc. [JSAI], 2000 [Table 21]).

Important factors to note include:

- Estimated total return flow, after conservation is implemented, resembles current rates (44 to 55 percent of water use). The estimated volume (acre-feet) of return flow is between 73 and 114 percent of current levels, depending upon achieving conservation goals and population growth. Note that return flow will be better retained through outdoor conservation measures, as outdoor uses do not readily return water back to the river.

- After the water resources program for Albuquerque is implemented (planned for 2006), surface water would be diverted for drinking water, and pumping of the aquifer would be reduced. Assuming the City reduces its surface water diversion relative to the reduction in demand, conserved water potentially could be considered as "retained" flow (i.e., water that remains in the river) to supplement the return flow to the river. The City of Albuquerque Proposed Drought Plan suggests that withdrawal from the river for drinking water would cease in times of drought (City of Albuquerque, 2002c).

Impacts to Water Quality (and mitigations)

Conversion of landscapes from sprinkled turf to drip-irrigated xeriscapes will reduce non-point source pollution by reducing runoff and erosion. However, if landscapes are not replanted with low-water-use plantings to stabilize soil, erosion and silting could result.

Watershed/Geologic Impacts

Water conservation will help preserve and postpone permanent damage to the aquifer and postpone the threat of land subsidence due to over-pumping of the aquifer.

3.1.2 Environmental Impacts

Impact to Ecosystems

Pumping of non-renewable groundwater and withdrawal of surface water will be reduced, thereby reducing the risk of or extending the time before the aquifer would suffer permanent damage or subsidence. In addition:

- Runoff and soil erosion will be reduced when landscapes are converted from turf using chemicals and spray sprinklers to low-water-use plants with drip systems.

- Energy use and air emissions associated with landscape maintenance will be reduced.

Implications to Endangered Species

As shown in Table 18-2, projected return flow estimates range from 73 to 114 percent of current return flow rates. Based on this:

- The impact the water flow available to the silvery minnow in the Rio Grande may be slightly impacted by conservation, depending upon how return flow rates change after implementing indoor and outdoor conservation measures.

- If conservation leads to reduced surface water withdrawals, water saved through conservation measures can be considered as "retained flow" in the Rio Grande and be more available to endangered species.

3.2 Financial Feasibility

3.2.1 Initial Cost to Implement

The cost of an acre-foot of conserved water can be computed on an annual basis (e.g., public education programs), or amortized over the life of the conservation measure (e.g., conversion of landscape and irrigation system). However, conservation may preserve water that cannot be replaced through the purchase of water rights (if these rights are not available on the market), and the computed costs for an acre-foot of conserved water are probably not comparable to the permanent consumptive-use water right (approximately $4,500/acre-foot on current market). Rather than make a cost comparison, this discussion summarizes potential conservation costs.

- Publicly and privately funded costs associated with conservation include (1) public education campaigns, (2) staff to administer the program, (3) labor and materials to convert landscape plantings, and (4) labor and materials to convert existing fixtures to low-water use fixtures.

- The City of Albuquerque estimates that approximately 56.6 billion gallons of water (17,186 acre-feet) were saved between 1994 and 2001 through conservation measures. These savings cost the utility $72 or $152 (depending upon how it is calculated) for every acre-foot of water that has been conserved. The City's conservation program budget has averaged $2.2 million per year or $15.4 million for the seven years (1995 through 2001) (Witherspoon, 2002a, p. 26.) Note that this estimate does not include private funds invested to install conserving fixtures, landscapes or irrigation systems.

- For the MRG planning region, a unified approach to public education efforts (i.e., public relations efforts on radio, television, and printed media) is possible because the water planning area is a single media market. Public education efforts can be overseen and coordinated by a staff person designated to work with the conservation efforts of all jurisdictions within the region. This individual would assemble, duplicate, and disseminate existing public education and outreach materials to utilities and customers throughout the region.

- Cost for a mid-level professional full-time employee is estimated at $60,000 (including benefits and overhead). The employee's time would be divided among tasks associated with A-18, A-22 and A-56 of this feasibility analysis.

- Cost for additional services by a public relations, education, and outreach consultant is assumed to range from $180,000 to $2.2 million per year, based on current expenditures for existing programs (Rio Rancho and Albuquerque, respectively).

- The conversion of existing landscapes to xeriscapes costs an average of $2.00 per square foot and can add up to a significant investment. Further detail can be found in Exhibit 18A, Table 18A-7 (*Estimated Cost to Reduce the Area and Change-Out Plantings and Irrigation Systems for Residential Landscapes, Golf Courses and Parks/Medians*). If high-water-use landscapes are reduced (by 30 percent for parks and golf courses and to an average of 800 square feet per residential unit), the public and private investment would approach $520,000,000. Indoor fixture replacement can range from $25 to $600 per household, or an estimated $400,000 to $9,600,000for the region as a whole. Further detail can be found in Exhibit 18A, Table 18A-6 (*Estimated Savings and Costs Attributed to Installation of Water Conserving Fixtures and Appliances*).

3.2.2 Potential Funding Source

The costs of implementing a public program are generally shared among the customers of the water supplier/utility. Individual water users pay for installation of water conservation measures. Customers' investments can be offset by a rebate on a portion of the expense.

3.2.3 Ongoing Costs for Operation and Maintenance

- Staff and/or contractors would be needed on a long-term basis to coordinate water conservation efforts to encourage water users to continually find new ways to reduce water use.

- Public education efforts would need to continue on a long-term basis to keep water conservation in the public's consciousness. Ongoing public education efforts will help conservation rates increase and prevent users from reverting to higher water use.

- Leak detection and repair of public water supply infrastructure is essential to reduce water waste. Irrigation systems need ongoing maintenance to prevent over-watering and water waste, and to keep systems in good repair.

4. Drought Contingency Planning

A regional Drought Task Force should be convened with representatives from each area of the region and from various water use sectors to meet, discuss, and recommend a regional drought plan. Task force members would include representatives from each jurisdiction in the water planning area, such as government officials, administrative staff familiar with water conservation program, ditch masters, commercial, industrial and institutional leaders, agricultural/ livestock owners, and community members. The task force would help assure that the drought plan corresponds to the needs and abilities of local users. It also would foster broad ownership, better acceptance, and the development of a community network to help with implementation. This regional Drought Task Force should coordinate with the Drought Task Force convened by the State of New Mexico and other task forces in the region (e.g., the City of Albuquerque).

The regional drought plan would address various levels of drought, based on severity (Table 18-4):

- Stage I: Drought Advisory
- Stage II: Drought Warning
- Stage III: Drought Emergency

Table 18-4. Proposed Water Use Goals to Be Met With Drought Response Measures

Drought Stage	Water Use Goals (gpcd)					
	Composite			Residential Only		
	Total	Indoor	Outdoor	Total	Indoor	Outdoor
Drought Stage I	120	80	40	65	45	20
Drought Stage II	100	60	40	50	40	10
Drought Stage III	90	54	36	45	40	5

gpcd = Gallons per capita per day

A drought plan would include:

- Drought indicators
- Drought response measures
- Implementation strategies

Estimated savings of drought mitigation measures are based on experience with conservation measures, the results of which are compared with the average water use in the region. Combined totals of drought response measures should be reduced, as appropriate, to account for overlap of measures (i.e., public education and limits on outdoor watering).

A highly effective water conservation program may reduce the potential savings of a drought mitigation plan because some of the drought recommendations have already been implemented. Also, the public may fail to distinguish the difference between drought mitigation measures and water conservation measures they have already been asked to perform. One major difference is that drought measures require a short-term response time while conservation measures can change things in a more fundamental way for long-term savings.

Estimates of water saved through the implementation of drought measures are based on savings achieved by replacing non-conserving fixtures, appliances, and landscapes with the appropriate water-saving counterparts. Water use goals associated with the various drought stages goals can be changed over time as the region achieves and reshapes its conservation goals. For example, drought goals may strive for greater reduction as overall usage rates are lowered over time.

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