

# 8

## Water Plan Alternative Actions and Evaluation

The alternative actions presented in this plan are the products of a long and extensive compilation, selection, and evaluation process designed to maximize input from many sources. Since 1999, the Alternatives Working Team of the Middle Rio Grande Water Assembly's (Water Assembly) Action Committee has been instrumental in formulating and analyzing alternative actions for water management in this region. The Alternatives Working Team established a methodology and decision process for identifying and evaluating feasible alternatives for regional water management to meet anticipated water demand (Alternatives Working Team 2001). A unique aspect of the analysis methodology was applying a two-track evaluation process. One track required a feasibility analysis by a consortium of experts while another track utilized a public participation process to identify public preferences regarding each alternative. Both sets of evaluations were considered in creating the recommendations in this plan.

### 8.1 Candidate Alternative Actions

The Water Assembly conceived the idea of "alternative actions" to provide specific technical, planning and management actions designed to reduce water consumption and/or to use water resources more efficiently. These alternative actions were intended to eventually form the basis of the Middle Rio Grande Regional Water Plan. At a variety of public meetings and workshops over a two-year period, the Water Assembly asked members of the public, technical experts and water managers to suggest alternative actions that could or should be included in the plan. This process generated 273 suggested alternative actions. The Alternatives Working Team screened this initial set to eliminate duplication and to consolidate where possible into a smaller number of more composite alternative actions. The result was a list of 44 candidate alternative actions that could then be analyzed for their feasibility and popularity. Supporting Document E-7 provides information on how each alternative action was handled. For organizational purposes the candidate alternative actions were classified into seven broad categories:

- Increase water supply
- Decrease or regulate water demand
- Change water use
- Water rights regulation
- Water quality protection
- Implementation of the water plan
- Funding

Under these categories, the alternative actions were released to the general public in September 2002 and at the Community Conversations Series 5 held that month, attendees were asked to select their most preferred and least preferred alternatives.

In October 2002 the Mid-Region Council of Governments issued a contract to Daniel B. Stephens and Associates Inc. to provide detailed feasibility analyses and prepare fact sheets on 25 of the alternatives. The large number of alternatives combined with limited funding precluded conducting detailed analyses on all 44 alternatives. Consequently, the Alternatives Working Team and the Analysis Team (both of which included technical experts as members) conducted a preliminary review of all 44 alternatives and identified the 25 that were most appropriate for detailed analysis. The contractor subsequently evaluated these. The

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Alternatives Working Team, through a qualitative approach that was less intensive but sufficient for understanding each alternative, evaluated the remaining 19 alternatives and prepared fact sheets. Supporting Documents Series G present the fact sheets that Daniel B. Stephens and Associates developed and Supporting Documents series J provide the fact sheets that the Alternatives Working Team developed.

Sections 8.1.1 to 8.1.7 present the highlights of the analysis of the 44 candidate alternative actions. For each alternative, there is a description and a several key points to provide a sense of the nature and scope of the alternative. The brief analysis looks at issues relating to water, cost, time, tradeoffs, and other considerations. The alternatives are arranged by the seven broad categories identified above. For each alternative, the A-number (e.g. A-66) reflects an original coding system to provide each alternative with a consistent referent throughout the planning process.

### **8.1.1 Category: Increase Water Supply**

#### *Watershed Plans (A-66)*

**DESCRIPTION:** Implement local and regional watershed management plans through all land and water agencies in the planning area. Once a water plan is agreed upon, coordinate the implementation among the numerous agencies at local, state, tribal, and federal level, which have some jurisdiction in the matter.

#### **BRIEF ANALYSIS:**

##### **Water:**

- Watershed treatments may improve water quality
- For potential changes in supply, thinning was evaluated because it has the largest impact on regional supplies
- Thinning forests increase stream flow where precipitation > 20 in/yr
- Save 5,000 to 15,000 acre-feet per year (afpy) for 30 to 70% of such area

##### **Cost:**

- Thinning: \$250 to \$1,000/acre depending on terrain

##### **Time:**

- Immediate to ongoing

##### **Tradeoffs:**

- Thinning may increase erosion and add new road construction
- Environmental impacts, if not done properly

##### **Other Considerations:**

- Watershed treatment also includes enhanced infiltration, erosion prevention and development controls (A-33)
- Increased streamflow likely to fulfill existing water rights - not result in new water right
- Watershed treatments such as grazing management could result in improved water quality
- Forest management can help to prevent catastrophic forest fires

### *Bosque Management (A-1)*

**DESCRIPTION:** Restore bosque habitat and manage vegetation in the bosque to reduce evapotranspiration by selectively removing vegetation and promoting native plants. For example, the Russian olive and salt cedar trees are high water consumers and inhibit the growth of other low-water plants. Return the bosque either to cottonwood or a mosaic of grasses, trees and shrubs. Research is underway to determine how much water would be saved.

#### **BRIEF ANALYSIS:**

##### **Water:**

- Removing high water use plants in bosque (13,000 acres) could save 13,900 afpy

##### **Cost:**

- Initial removal cost: \$180 to \$600/acre
- Minimal maintenance cost

##### **Time:**

- Immediate to ongoing

##### **Tradeoffs:**

- Necessity of increased protection due to increased access

##### **Other Considerations:**

- Revegetation not recommended where cottonwood overstory is present
- Endangered species may be affected if projects improperly planned
- Increased streamflow likely to fulfill existing water rights - will not result in new water right

### *Reservoir Management (A-45)*

**DESCRIPTION:** Reduce open water evaporation in storage reservoirs by retaining water at higher elevations or latitudes, or by reducing surface areas. Under the provisions of the Rio Grande Compact, NM must reserve a certain amount of water in the Elephant Butte reservoir for use by Texas. Both the shape of the reservoir, which has been compared to a champagne glass, and the location, which is in a hot area of the state, contribute to a high percentage of evaporation. Water lost to evaporation is not counted toward the deliverable to Texas. Proposal is to reduce the amount of water lost to evaporation by any of various means, including:

1. Cover Elephant Butte Lake with surfactants, a thin layer of “goop” that would reduce evaporation. Sandia National Laboratories is working to develop a non-hazardous product that would do this.
2. Store some or all of the water in a cooler region. With a better management plan, it might be possible to minimize the water sent to Elephant Butte and keep it in a cooler region of the state. Or, it may be possible to negotiate new agreements with Texas and Colorado within the Compact.
3. Aquifer storage and recovery may solve some of the legal obstacles to alternate storage.

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### **BRIEF ANALYSIS:**

#### **Water:**

- Save 3,800-7,300 afpy by moving 50,000 to 100,000 acre-feet (af) from Elephant Butte Reservoir to El Vado or Abiquiu Reservoirs

#### **Cost:**

- Elephant Butte to Abiquiu = \$130/af

#### **Time:**

- 5 years to decades

#### **Tradeoffs:**

- Impact on recreation
- Inundation of private property

#### **Other Considerations:**

- Dredging
- Surfactants
- New Reservoirs

## *Surface Modeling (A-38)*

DESCRIPTION: Increase monitoring and modeling of surface water system to improve water management at the watershed level, and retain excess water flow from Elephant Butte Reservoir during wet cycles. Under the Rio Grande Compact, NM accrues credits for excess water flow and debits for deficits. A spillover of the Elephant Butte dam wipes out all accumulated debits. Proposal is to improve monitoring of the snow pack so that NM is able to predict how much water to let flow down to Elephant Butte and thereby manage the wet year water excess to NM's best interest.

### **BRIEF ANALYSIS:**

#### **Water:**

- No direct water savings from modeling
- Water savings could occur if modeling is used to improve efficiency

#### **Cost:**

- Operation and maintenance costs = \$1 million on Upper Rio Grande Water Operations Model
- Federally financed

#### **Time:**

- Ongoing

#### **Tradeoffs:**

- Reduction of downstream surface waters if operations are changed to retain more water in reservoirs

#### **Other Considerations:**

- No single permanent management agency

### *Aquifer Storage (A-46)*

DESCRIPTION: Inject water treated to drinking water standards for aquifer storage in appropriate locations throughout the water-planning region. Use the aquifer as interim storage for surplus water. It may be possible to pump surplus water back into the aquifer. Technical issues exist regarding quality of the water to be injected. It is not known how much of the water would be retrievable. Further research is needed.

#### BRIEF ANALYSIS:

##### **Water:**

- Arroyo recharge: 100-10,000 afpy
- Wastewater ASR: 1,000s afpy
- Transfer from EB: 100,000 afpy

##### **Cost:**

- Low cost to recharge surface water
- High cost to treat wastewater for recharge

##### **Time:**

- 1 to 20 years

##### **Tradeoffs:**

- Diverts surface water to ground water

##### **Other Considerations:**

- Rio Grande Compact issues
- Impacts to Elephant Butte and recreation

### *Reuse Greywater (A-24)*

DESCRIPTION: Promote, through incentives, on-site residential and commercial greywater reuse and recycling. Provide incentives to implement greywater reuse systems in residential and commercial properties. Greywater reuse systems would require separate on-site plumbing, which makes them more expensive to implement. Considerations also include defining standards for the level of treatment for greywater so that it is healthy enough for non-potable uses. For example, mitigate the presence of household chemicals and biological hazards in greywater.

#### BRIEF ANALYSIS:

##### **Water:**

- Fresh water diversion reduction: 20 to 25% (consumptive use remains constant)

##### **Cost:**

- New construction: \$65 to \$650 per system
- Retrofit (assumes easy access to plumbing): \$135 to \$1,250 per home

##### **Time:**

- Immediate for new construction once ordinances are adopted

##### **Tradeoffs:**

- Reduced return flow

**Other Considerations:**

- Permitted as a liquid waste disposal system (complex)
- New Mexico Environment Department proposed regulatory changes could streamline permitting process.

*Reuse Treated Effluent (A-27)*

DESCRIPTION: Reuse treated wastewater for non-potable uses. The cost to bring wastewater to a state where it can be used for watering lawns, etc., is much lower than cleaning the water to a drinkable level. Find a way to distribute the treated wastewater for any or all non-drinking needs. The treated wastewater can be reused once or several times before it is returned to the river or lost to evaporation. Several implementation approaches are possible. One approach is to retrofit homes and businesses with a second set of water pipes. Another approach is to apply this to new construction only.

BRIEF ANALYSIS:

**Water:**

- Available for reuse: 9,900 afpy in 2003 to 27,900 afpy in 2050

**Cost:**

- \$54 to \$131 million capital costs in 2003
- \$6 to \$14 million operation and maintenance in 2003

**Time:**

- 5 to 10 years

**Tradeoffs:**

- Reduced river flow and return flow credits
- Water quality issues

**Other Considerations:**

- Reduced river flows -possible endangered species impacts

*Desalination (A-39)*

DESCRIPTION: Utilize technological advances for treating deep saline and brackish water for potable or non-potable use in the region. Desalination is used in various parts of the world to obtain fresh water. These techniques could be applied to brackish water in several of the NM basins, or even to ocean water. Possible sources: Tularosa basin (near Alamogordo); an unnamed basin West of Albuquerque; Gulf of California or other ocean. Brackish water may be available at the bottom of Rio Grande basin. There are significant technical, economic, and environmental issues associated with this, including the cost of desalination, disposal of brine waste, and the cost of deep water pumping.

BRIEF ANALYSIS:

**Water:**

- New supply only from saline formations not connected to the Rio Grande

**Cost:**

- \$600 to \$1,400/af produced
- High pipeline costs
- High energy costs

**Time:**

- 1 to 10 years

**Tradeoffs:**

- Unknown impact on aquifer

**Other Considerations:**

- Permitting: Office of the State Engineer (OSE) and National Pollutant Discharge Elimination System
- Brine disposal

*Importation of Water (A-69)*

DESCRIPTION: Acquire additional water rights without condemnation from various sources from within or outside the water-planning region, and import water from other basins where possible. Under NM law, water rights are a property right and can therefore be condemned if it is in the public interest to appropriate the water for another use. It is becoming increasingly difficult to find willing sellers and the cost to purchase and transfer water from place to place is quite high.

BRIEF ANALYSIS:

**Water:**

- Possible increased availability of water resources

**Cost:**

- High cost to construct pumping and conveyance systems

**Time:**

- Long range

**Tradeoffs:**

- Interbasin conflicts
- Diminish water at source in order to increase water at destination

**Other Considerations:**

- Legal, environmental, and social constraints

*Water Harvesting (A-44)*

DESCRIPTION: Encourage on-site rainwater harvesting. The vast majority of rainfall is lost to evaporation. If a percentage of this rain could be collected, it would provide a significant additional source of water. There are legal issues concerning impoundment of storm water and impairment of water rights as well as issues bearing on the quality of harvested water.

BRIEF ANALYSIS:

**Water:**

- Water harvested from rooftops might reduce depletion by 5%
- At 8 in rainfall/yr, yield is about 4,900 gal/1,000 sq ft rooftop

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### **Cost:**

- Special storage tanks: \$1/gallon (other costs for system)

### **Time:**

- Immediate and ongoing

### **Tradeoffs:**

- Currently, rooftop water runoff to river or into soil moisture zone
- Quality of harvested water: safe for outdoor use

### **Other Considerations:**

- Legal issues: impoundment of stormwater and impairment of rights
- Maximize capture and storage of typical high-intensity rainfall

## *Soil and Vegetation Management (A-33)*

DESCRIPTION: Establish erosion prevention measures and use soil and vegetation management techniques to reduce runoff and increase infiltration throughout the watershed, including forested mountains and uplands. Expand watershed management programs. These programs are intended to slow runoff and reduce erosion through various means, for example, installing better groundcover, restoring grasslands and canopy environment, and controlling watercourse drainage. Establish vegetation management programs. Regional forests, including the bosque, are currently full of small diameter trees and brush. This not only presents a fire hazard, but it also consumes water and prevents natural infiltration of rainwater and snowmelt.

### BRIEF ANALYSIS:

#### **Water:**

- Intent: slow runoff, reduce erosion, increase infiltration
- Possible gain to ground water

#### **Cost:**

- Medium to high cost for implementation
- High maintenance cost

#### **Time:**

- Immediate expansion of existing programs, but ongoing

#### **Tradeoffs:**

- Potential reduction of surface flow to river

#### **Other Considerations:**

- Program effectiveness dependent on research/evaluation

## *Vegetation Removal Products (A-2)*

DESCRIPTION: Develop the economic potential of non-native species removal, harvesting, and output of products by local industries. The objective is to develop products that use the plants being removed by vegetation management programs. If implemented successfully, this could become an income source rather than a cost.

### BRIEF ANALYSIS:

**Water:**

- Salt Cedar biomass to energy conversion
- 202 to 785 afpy water saved per acre of Salt Cedar removed

**Cost:**

- Small power generation plant: \$800,000
- Clearing Salt Cedar: \$500 to \$1,000/acre
- Net cost range: from loss of \$820/acre to gain (profit) of \$445/acre

**Time:**

- Power plant on-line in one year

**Tradeoffs:**

- Need market for energy distribution

**Other Considerations:**

- Furniture manufacture
- Pulpwood

*Storm Water Management (A-34)*

DESCRIPTION: Enhance and expand local government storm water plans and programs to control runoff using swales, terraces, and retention structures to minimize erosion, enhance infiltration and recharge, and prevent pollution of surface and ground water. The majority of local governments in the region do not have programs of this nature because the cost is relatively high and the benefits are either long-term or indirect.

BRIEF ANALYSIS:

**Water:**

- Enhanced infiltration with some recharge to ground water
- Reduced levels of urban storm water pollution to water resources

**Cost:**

- Cost associated with administration and enforcement of regulations
- Cost of construction of stormwater control structures

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Reduces runoff into the river

**Other Considerations:**

- Clean Water Act Urban Storm Water Regulations – Phase II

*Vegetation Management (A-40)*

DESCRIPTION: Continue evapotranspiration studies and apply findings to vegetation management programs in the water-planning region. Evapotranspiration is the water given off by plants. More research is needed to understand how much water comes from which types of plants and under what conditions. Use this information to minimize riparian water loss.

**BRIEF ANALYSIS:**

**Water:**

- Possible gain to ground water

**Cost:**

- Medium to high research costs
- Implementation costs unknown

**Time:**

- Ongoing, long term

**Tradeoffs:**

- Unknown

**Other Considerations:**

- Funding availability
- Application of research results

*Wetlands (A-36)*

DESCRIPTION: Create constructed wetlands for groundwater recharge, water harvesting, and habitat improvement, and hydrological management of the Rio Grande. Use constructed wetlands as an alternative method for treatment of sewage and other forms of greywater. Technical considerations include the difficulty of protecting the wetland plants from destruction by heavy downpour and floods. In addition, a significant amount of water is lost to evaporation and evapotranspiration.

**BRIEF ANALYSIS:**

**Water:**

- Potential for recharge to ground water

**Cost:**

- Medium cost to construct wetlands and catchments

**Time:**

- Ongoing, long term

**Tradeoffs:**

- Reduced flow to the river
- Potential increase in evapotranspiration

**Other Considerations:**

- Improved water quality and habitat
- Clean Water Act Urban Storm Water Regulations – Phase II
- Potential for state/federal program funding

*Weather Modification (A-42)*

DESCRIPTION: Conduct research on innovative water supply enhancement techniques such as weather modification. If a way is found to do this effectively in this region, it could create additional water supply. This is a highly experimental field.

BRIEF ANALYSIS:

**Water:**

- Cloud seeding program to increase precipitation
- 10 to 20 percent gain in precipitation in experimental target areas

**Cost:**

- Annual operating costs: \$200,000 to \$500,000

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Unpredictable results of cloud seeding

**Other Considerations:**

- Program in partnership with state and federal agencies
- Cloud seeding dependent on moist air mass

**8.1.2 Category: Decrease or Regulate Water Demand**

*Urban Conservation (A-18)*

DESCRIPTION: Adopt and implement local water conservation plans and programs in all municipal and county jurisdictions, including drought contingency plans. Many programs are possible; for example, publicity campaigns, pricing schemes, or installation of low-flow devices. Encourage xeriscaping and drip irrigation. For example, bluegrass requires three times as much water as does native gramma or buffalo grass. In urban areas, where half or more of total water use is for landscaping, the substitution of low-water-use plants for high-water use varieties will save significant amounts of water. Note that groundwater pumping supplements river flow when it is returned as waste water. Therefore, reducing pumping will result in less return flow to the river, with its consequences, both to the environment and to the state's ability to meet its Compact obligations.

BRIEF ANALYSIS:

**Water:**

- Demand reduction: 149,000 to 155,000 af by year 2010
- Demand reduction: 238,000 to 292,000 af by year 2050

**Cost:**

- Per household: \$25 to \$950 for indoor plus \$500 to \$5,400 for landscape conversion

**Time:**

- Immediate and ongoing

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### **Tradeoffs:**

- Reduces return flow

### **Other Considerations:**

- High level of voluntary compliance required

## *Urban Water Pricing (A-21)*

DESCRIPTION: Examine a variety of water pricing mechanisms and adopt those that are most effective at conserving water. The mechanisms to be examined include: a) price water to reflect the true value; b) institute a moderately increasing block price schedule; c) institute a steeply increasing block price schedule; and d) other feasible incentives and subsidies for conserving water. In order to implement and enforce several of these mechanisms, metering and recording are necessary.

### BRIEF ANALYSIS:

#### **Water:**

- 10% reduction for 100% increase in cost

#### **Cost:**

- Assumes doubling of public water supply prices
- \$6,300/ af reduction in demand

#### **Time:**

- Rate change approval and implementation (1 year)

#### **Tradeoffs:**

- Assumes excess revenues reinvested in water related projects
- Equity issues regarding low-income households

## *Conservation Incentives (A-22)*

DESCRIPTION: Provide local government programs that offer subsidies for adoption of water efficient technologies and utilization of water saving devices. Promote the transition to water-saving devices and water-efficient technologies through incentives sponsored at the local level. (This could apply to both municipal and industrial customers.)

### BRIEF ANALYSIS:

#### **Water:**

- Possible reduction in demand
- Savings are accounted for in A-18

#### **Cost:**

- Rebate costs: \$140 to \$200/af saved

#### **Time:**

- Immediate and ongoing

#### **Tradeoffs:**

- Reduced wastewater flows and return

**Other Considerations:**

- Requires very strong conservation commitment to achieve projected savings

*Education (A-56)*

DESCRIPTION: Establish region-wide educational programs, including public and private school curricula, to encourage voluntary conservation of water. Over the long-term this will raise consciousness and change lifestyle use of water.

BRIEF ANALYSIS:

**Water:**

- Reduced demand 3 to 15% (5% = 8,700 acre-feet)
- Water savings included in A-18 water savings

**Cost:**

- \$80,000/year
- \$9/af water saved/yr

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Reduces return flow

**Other Considerations:**

- Most successful if integrated with other conservation programs

*Agricultural Metering (A-7)*

DESCRIPTION: Meter and manage surface water distribution flows through all irrigation systems to conserve water. Allows the accurate measurement and control of permitted water use and associated losses. Metering by itself may encourage conservation.

BRIEF ANALYSIS:

**Water:**

- 10% estimated improvement in irrigation system efficiency

**Cost:**

- Estimated Middle Rio Grande Conservancy District cost (Interstate Stream Commission funded) for 2003-04: \$160,000
- Proposed program cost: \$7 million

**Time:**

- 5 year implementation

**Tradeoffs:**

- Increased administrative, operational, and maintenance cost
- Legal technicalities regarding “banked” water rights

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### *Irrigation Efficiency (A-10)*

DESCRIPTION: Develop and employ alternatives to maximize irrigation efficiency on all irrigated land in the region. This is a follow-up to alternative A-7. Mechanisms include, but are not limited to:

1. Install drip, sprinkler, surge, or furrow irrigation where feasible. Note that this may not be feasible for some field crops such as alfalfa.
2. Laser-level fields to remove depressions where irrigation water settles.
3. Aggregate the small, strip farm plots so that alternatives become cost-effective.

#### BRIEF ANALYSIS:

##### **Water:**

- 7 to 14% improvement in on-farm irrigation efficiencies through land preparation, on-farm water management, on-farm water metering
- Program would address three farming/irrigation categories of use

##### **Cost:**

- \$29 million for regional program

##### **Time:**

- 5 to 10 years

##### **Tradeoffs:**

- Reduces recharge to ground water, which could impact ecosystems within the overall Middle Rio Grande Conservancy District irrigated areas

##### **Other Considerations:**

- Significant technical and financial assistance components

### *Conveyance Systems (A-9)*

DESCRIPTION: Develop conveyance alternatives for water transportation in agricultural irrigation systems. Most irrigation systems in the Middle Rio Grande (MRG) planning region deliver water and carry some return drainage flow through unlined ditches (canals). Off-farm irrigation water losses exist as riparian evapotranspiration, seepage, illegal diversion, and canal breaches, resulting in substantial amounts of water not being delivered to users. This alternative action calls for the study of the off-farm conveyance system issues and proposed solutions such as various types and combinations of canal lining systems, pipes, and improved diversion and regulatory structures, to reduce losses preferably without impacting aesthetics. Such changes will improve irrigation efficiency and conservation, resulting in diverted water savings.

#### BRIEF ANALYSIS:

##### **Water:**

- Estimated 20% of Middle Rio Grande Conservancy District canals lined = estimated 40% reduced seepage
- Estimated 35% of Sandoval Co. acequias lined = estimated 60% reduced seepage

##### **Cost:**

- Middle Rio Grande Conservancy District program: \$121,000,000
- Sandoval Co. acequias: \$22,000,000

**Time:**

- Middle Rio Grande Conservancy District: 20 years (\$8 million/yr)
- Sandoval Co. acequias: 5 years (\$3.2 million/yr)

**Tradeoffs:**

- Reduced seepage to groundwater/ reduced return flows

**Other Considerations:**

- Legal issue regarding use of saved diversion water
- Cultural practice of ditch maintenance in small Sandoval systems

*Metering Water Supply Wells (A-8)*

DESCRIPTION: Meter all water supply wells, including domestic wells, throughout the water-planning region. Under the current system, domestic wells owners are allowed up to 3 acre-feet per year. Metering is not required so there is no way to monitor actual water use. Once the amount of water being used is known, there may be an incentive to use less of it.

BRIEF ANALYSIS:

**Water:**

- Metering may provide incentive to use less water

**Cost:**

- Domestic well meter (installed) costs about \$400
- Monitoring and enforcement costs would be significant

**Time:**

- Medium to long term period to implement

**Tradeoffs:**

- Based on public input, metering is not strongly supported

**Other Considerations:**

- Metering could provide a basis to change domestic well statutes
- Funding assistance by the state

*Domestic Well Controls (A-61)*

DESCRIPTION: Reduce the allowed pumping from domestic wells and restrict drilling of domestic wells where surface waters or the aquifer could be impaired. This alternative requires that well metering be in place.

BRIEF ANALYSIS:

**Water:**

- Intent is to preserve water in “critical management areas”

**Cost:**

- Domestic well meter (installed) costs about \$400
- Monitoring and enforcement costs would be significant

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### **Time:**

- Medium to long term period to implement

### **Tradeoffs:**

- Development limitations in critical management areas
- Drilling restrictions and/or pumping limitations

### **Other Considerations:**

- Designation of critical management area by State Engineer
- Potential opposition to regulation but support for cumulative effects

## *Acequia Conservation Programs (A-60)*

DESCRIPTION: Fund irrigation organizations to develop and implement water conservation programs. There are two common types of irrigation organizations: traditional acequias and conservancy district ditches. The approach to conserving may differ whether one considers traditional community acequias or conservancy district acequias. Conservancy district acequias tend to be much larger and might require federal funding to implement the changes.

Note: The Conservancy District of the MRG was created in 1924 to manage water delivery along the Rio Grande from Cochiti Lake to Elephant Butte. The district taxes property owners to fund management of the ditches and dams.

### BRIEF ANALYSIS:

#### **Water:**

- Decreased demand may be possible through efficiency of use

#### **Cost:**

- Minimal cost to implement

#### **Time:**

- Immediate

#### **Tradeoffs:**

- Social and cultural implications

#### **Other Considerations:**

- Increased viability of acequia systems

## **8.1.3 Category: Change Water Uses to Increase Supply or Decrease Demand**

### *Low-Water Crops (A-11)*

DESCRIPTION: Develop markets for locally-grown produce, and low-water alternative crops. Increasing production of low-water alternative crops would reduce overall dependence on water. Research is required to identify the crops and the markets, and plan for the transition. Investigate the associated costs, labor, and time requirements.

### BRIEF ANALYSIS:

**Water:**

- Switching 5,000 acres from alfalfa to sorghum would reduce consumptive use by 4,300 acre-feet.

**Cost:**

- Variable, depends on market

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Change in crops requires different farming infrastructure
- May require more labor and maintenance

**Other Considerations:**

- No economic incentive for switching crops
- 90% of MRG acreage in forage crops (high water use)

*Land Use (A-30)*

DESCRIPTION: Adopt policies to integrate land use and transportation planning and water in resource management in all government jurisdictions in the Middle Rio Grande water planning region. Take water supply limitations into account when making land use development decisions. Develop mechanisms for local governments to adopt policies that coordinate water impact considerations with all land development and other uses of water.

BRIEF ANALYSIS:

**Water:**

- Change in policy had no immediate effect on demand, see A-18 and A-22

**Cost:**

- Administration and enforcement costs

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Reduced wastewater return flows
- Reduction in water provider revenues
- Increase in development costs

**Other Considerations:**

- May require more stringent regulatory controls

*In-Fill/Density (A-28)*

DESCRIPTION: Increase building densities (as compared to typical suburban density) and infill development through adoption of local government land use policies and regulations. This would be accomplished through local government land use policies, regulations, and incentives. Implementing this would require regulatory changes at the

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local level, for example, making house lots smaller or building multi-story dwellings. Higher-density development would reduce the relative footage of landscaping and associated water use

### **BRIEF ANALYSIS:**

#### **Water:**

- Increased density can reduce outdoor water use
- Increase from 5.7 to 7.4 dwellings per acre for new construction reduces outdoor use by 170 afpy

#### **Cost:**

- Administration and enforcement costs

#### **Time:**

- Effective when new development takes place

#### **Tradeoffs:**

- Congestion due to increased density

#### **Other Considerations:**

- Not attractive in rural areas
- Reduces sprawl

## *Preserve Deep Water for Drinking (A-15)*

DESCRIPTION: Preserve, but continue to draw, deep-well water for drinking purposes only. Removing vast quantities of water from the aquifer is lowering the water table and creating various surface water problems. Proposal is to limit consumption of aquifer waters for drinking purposes only and obtain water for other purposes from other sources. The technical issue is how to deliver two grades of water to urban user. Installation of a dual-piping system is quite costly for existing construction. An alternative is to make treated river water available from the taps and provide ground water in bottled form.

### **BRIEF ANALYSIS:**

#### **Water:**

- Preservation of high-quality deep well water

#### **Cost:**

- Cost undetermined

#### **Time:**

- Medium range time to implement

#### **Tradeoffs:**

- Restricting and controlling deep well water
- May require new infrastructure

#### **Other Considerations:**

- Changes to public drinking water habits
- Distribution of drinking water

## 8.1.4 Category: Water Rights Regulation

### *Instream Flow (A-63)*

**DESCRIPTION:** Change state water law to include in-stream flow as a beneficial use. Under current law, to maintain a water right, you must put it to beneficial use. Water flowing in the river, known as "instream flow," has not been declared a beneficial use in New Mexico. However, the health of the river affects state parks and animals that live in the river environment. By determining beneficial use to include instream flow there would be some legal protection for riparian uses of water.

#### **BRIEF ANALYSIS:**

##### **Water:**

- Benefit to riparian environments

##### **Cost:**

- Water right transaction cost (move water from existing beneficial use to instream flow use)

##### **Time:**

- Immediate and ongoing

##### **Tradeoffs:**

- May not necessarily augment flows (water could be lost to seepage)

##### **Other Considerations:**

- Office of the State Engineer has authority to recognize instream flow as beneficial use
- Additional statutory clarification would strengthen
- Requires gaging

### *Conjunctive Management (A-144)*

**DESCRIPTION:** Address groundwater/surface water interactions in the statutes for administering water rights. There is a connection between surface water and shallow ground water. That is, by extracting groundwater, surface water will percolate down to the shallow groundwater and "fill in" the volume of water that has been pumped. This interaction has a time lag and will not be immediately observable. For groundwater wells near the river, the effect may take days or weeks depending on the separation distance. For groundwater wells further away, the effect could take weeks or years. One example of the need for this accounting of the interaction of surface water and groundwater is that a junior water rights holder, who has pumped groundwater, could later "infringe" on the water supply to senior surface rights holders, particularly during a time of drought.

#### **BRIEF ANALYSIS:**

##### **Water:**

- Maximizes use of available water resources

##### **Cost:**

- Administrative and permitting costs

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### **Time:**

- Immediate and ongoing

### **Tradeoffs:**

- Requiring junior users to purchase or lease senior water rights can offset tension
- Administrative (OSE) change necessary to implement

### **Other Considerations:**

- Reduced uncertainty about water availability and transfer

## *Water Rights Adjudication (A-71)*

DESCRIPTION: Identify, quantify, and adjudicate all water rights and the order of wet water utilization in the water-planning region. Adjudication is the legal process of reviewing all water rights claims in an area to determine which are actually defensible. The process results in a clear accounting of how much water may be used and by whom. Currently, on average, there are more claims than there is water, so this process would clarify who must stop using water during a water shortage.

### BRIEF ANALYSIS:

#### **Water:**

- Prerequisite to water rights determination

#### **Cost:**

- High cost to administer

#### **Time:**

- Long term to complete adjudication

#### **Tradeoffs:**

- Uncertainty of junior rights
- Process may create social conflict

#### **Other Considerations:**

- Tribal and acequia concerns
- More orderly management of water

## *Evaporative Loss Accounting (A-51)*

DESCRIPTION: Establish more equitable accounting for evaporative losses in Rio Grande Compact water. Per the Rio Grande compact, NM is required to keep a certain amount of water in Elephant Butte reservoir. A large amount of the water in the reservoir is lost to evaporation. The evaporative loss would normally be shared among all water users, both Texas and New Mexico. Change the Compact so that Texas is responsible for some of the evaporative loss, which would reduce the delivery amount that New Mexico owes Texas. Renegotiating the Compact is highly unlikely.

### BRIEF ANALYSIS:

#### **Water:**

- Reduction in evaporative losses of water in Rio Grande system
- Storage location changes

**Cost:**

- Cost undetermined

**Time:**

- Medium to long range period to implement

**Tradeoffs:**

- Impact on lake recreation uses

**Other Considerations:**

- Rio Grande Compact issues
- River management
- Fair distribution of consumptive accounting

### 8.1.5 Category: Water Quality Protection

#### *Water Quality (A-47)*

DESCRIPTION: Identify, protect and monitor areas vulnerable to contamination (quality issue) and restrict groundwater supply wells in sensitive areas. This is a particular issue where there is a high-density of shallow wells, septic systems, and leaking storage tanks. Development near many public wells is not monitored or controlled and could create sources of contamination of the public water supply. In addition, high concentrations of domestic wells in close proximity to septic systems represent a serious regional water contamination issue. Local governments do not keep records on the relative placement of wells and septic systems.

BRIEF ANALYSIS:

**Water:**

- Higher treatment costs required to make water available for different beneficial uses
- Arsenic and septic contamination are primary water supply concerns

**Cost:**

- Cost of administration and management
- High cost to monitor ground water quality
- High clean-up costs

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Development restrictions in vulnerable areas

**Other Considerations:**

- New standards (i.e., arsenic by 2006)
- Already numerous contaminated areas
- Identification and protection of vulnerable areas

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### *Domestic Wastewater (A-26)*

**DESCRIPTION:** Expand use of centralized wastewater collection and treatment systems into all areas of urban and suburban development within the water planning region. Certain areas of the region rely on septic tank systems, which do not adequately purify the water before it returns to the groundwater. Technical limits such as distance and pipeline size make implementation costly.

#### **BRIEF ANALYSIS:**

##### **Water:**

- No effect on demand
- Supply could be increased with use of treated wastewater

##### **Cost:**

- Regional system expansion capital cost in 2003: \$67 to 181 million
- Regional system operation and maintenance cost for 2003: \$3 to 12 million

##### **Time:**

- Ongoing

##### **Tradeoffs:**

- More water for use, less pollution, reduced ground water recharge
- May induce new development

##### **Other Considerations:**

- Major infrastructure development required

### *Well Head Protection (A-50)*

**DESCRIPTION:** Enforce wellhead protection programs on all public water supply wells within local government jurisdictions. Federal and state regulations stipulate that public water supply wellheads must be protected to prevent contamination of groundwater. These regulations are not enforced. Most communities lack wellhead protection programs.

#### **BRIEF ANALYSIS:**

##### **Water:**

- Protection of water resources from contamination

##### **Cost:**

- Administrative cost of regulation and enforcement

##### **Time:**

- Immediate and ongoing

##### **Tradeoffs:**

- Stringent development controls near public water supply wells

##### **Other Considerations:**

- Well head protection zone should be delineated on technical merits
- Requires local government zoning authority

## 8.1.6 Category: Implementation of Plan and Management of Water Resources

### *Water Bank/Authority (A-67)*

DESCRIPTION: Establish a regional water management authority to provide professional water resource management and to administer or assist in a water banking program. A regional authority can provide coordination and consistent implementation of the regional water plan. Currently, water management is under the authority of various federal, tribal, state, and local departments. Water banking is a term used for several different concepts. It may be used to allow the authorized agency to make decisions about water transfers quickly. Water banking is also used to denote a system of leasing out unused water to avoid losing water rights. However, water banking may be detrimental to the acequia systems.

#### BRIEF ANALYSIS:

##### **Water:**

- Maximizes water resource management

##### **Cost:**

- Cost of administration

##### **Time:**

- Requires change in state law or joint powers agreement necessary prior to implementation.

##### **Tradeoffs:**

- Would require local authorities to give up some autonomy

##### **Other Considerations:**

- No statewide water banking law

### *Growth Management (A-52)*

DESCRIPTION: Develop a sustainable and coordinated growth management plan for adoption and implementation by local governments in the Middle Rio Grande region in order to: 1) reduce water consumption; 2) minimize impact on water resources; 3) encourage conservation-oriented economic development and 4) ensure adequate water supplies for any proposed development. A number of political issues affect this alternative, including: water authority is at the state level; land use authority is vested at the local level. Coordination would require one oversight agency. There is both strong support and strong opposition to this alternative. Growth policies need to recognize economic impacts and the limits of sustainability imposed by the amount of water available.

#### BRIEF ANALYSIS:

##### **Water:**

- Preserves water resources through efficiency of use

##### **Cost:**

- Cost of administration and implementation of local plans

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### **Time:**

- Implementation subject to regional policy decisions

### **Tradeoffs:**

- Legal complexities of regionalization
- May shift growth to less regulated areas

### **Other Considerations:**

- Regionalization of land use management
- Changes in land use development patterns
- Region-wide cooperation essential

## *Public Involvement Program (A-53)*

DESCRIPTION: Through open and inclusive processes, ensure public involvement in water planning by continuing regular public information/dissemination programs and public relations campaigns, and citizen planning committees. Keep the public engaged in this process. The theory is that as the public becomes better informed of the scale and complexity of the problems, there will be more pressure for change. People who understand the problem will be motivated to conserve water. Public participation ensures that a broad array of interests is represented.

### BRIEF ANALYSIS:

#### **Water:**

- Water savings may be initiated and ensured by an informed public

#### **Cost:**

- Significant funding necessary for public outreach

#### **Time:**

- Ongoing

#### **Tradeoffs:**

- Inherent conflict of competing interests

#### **Other Considerations:**

- Public involvement may influence water programs and policies
- Funding for public involvement programs

## *Maintain Water Resource Database (A-73)*

DESCRIPTION: Establish and integrate a regional Geographical Information System (GIS) database of publicly accessible information on water resources and photo imagery covering the water planning region. This would be a helpful tool for planning and modeling, provided the data is accurate.

### BRIEF ANALYSIS:

#### **Water:**

- Efficiencies of water use justified through information and analysis

**Cost:**

- Cost of computerized mapping and data management can be high

**Time:**

- Ongoing

**Tradeoffs:**

- Potential for conflicting data and information
- Potential for disagreement over analysis and interpretation

**Other Considerations:**

- Regional data repository
- Homeland Security issues (i.e., Bioterrorism Preparedness and Response Act of 2002)

*Active Water Resource Management (A-143)*

DESCRIPTION: Encourage active water resource management by the Office of the State Engineer/Interstate Stream Commission(OSE/ISC). Currently OSE administers water rights and associated data. The role of the OSE/ISC should be expanded to be proactive in managing our overall water resource.

BRIEF ANALYSIS:

**Water:**

- Water efficiency savings

**Cost:**

- Administrative costs

**Time:**

- Immediate and ongoing

**Tradeoffs:**

- Increased complexity in water rights administration

**Other Considerations:**

- Watershed impacts
- Potentially significant economic impacts

**8.1.7 Category: Funding Alternatives**

*Severance Tax (A-59)*

DESCRIPTION: Establish a state-based water severance tax for water projects, planning and conservation. The proposal is to tax the net withdrawal of water from the water system, especially ground water which is being depleted at a higher rate than it is being recharged. Establishing a severance tax or other taxing mechanism would implicitly recognize water as a state resource. The income could be used to fund other water management implementations.

BRIEF ANALYSIS:

**Water:**

- 1% reduction in water demand

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### **Cost:**

- Assumes a 10% increase in after tax price
- \$8000/af reduction in water demand
- Water consumption tax: \$100/af = \$20+ million/yr

### **Time:**

- Implementation dependent on changes in state law

### **Tradeoffs:**

- Detrimental to agricultural sector (most farmers could not afford this)
- Fluctuation of tax revenue streams
- Revenue would not keep up with inflation without tax increases

### **Other Considerations:**

- Tax administration- regional or state level
- Legal and political complexities
- Lack of metering or monitoring infrastructure

## *Regional Water Planning Program (A-58)*

DESCRIPTION: Water Funding - Establish dedicated and continuing funding for regional water planning as an ongoing process and as a basis for water management at local, regional and state levels. The regional water plan , once submitted and approved, will require periodic revision.

### BRIEF ANALYSIS:

#### **Water:**

- Regional water plan can effect local water management efficiencies

#### **Cost:**

- Administrative costs associated with planning process

#### **Time:**

- Current and ongoing

#### **Tradeoffs:**

- Potential for incompatible and contentious local water management without consensus on regional water policy

#### **Other Considerations:**

- Necessity of dedicated, ongoing funding
- Regional plans provide crucial input to state water plan

## **8.2 Evaluation of Alternative Actions**

The contracted consultant (Daniel B. Stephens & Associates, Inc.) rated the 44 alternative actions using a 5-point rating scale, with a score of 1 meaning low feasibility and a score of 5 meaning high feasibility. Each alternative action was assigned a feasibility rating score for each of five attributes:

- Technical feasibility
- Physical, hydrological, and environmental aspects

- Economic impacts
- Social and cultural implications
- Legal implications.

Attribute Ratings are based on professional judgment of technical team. The consultant team established the following written criteria to use in determining an alternative's rating:

Technical feasibility

- 1 Major impediment, very high cost, requires developing and proving new technology, lengthy or unknown time frame to implement.
- 2 Technology is under development but not proven, not cost effective, lengthy time frame to implement.
- 3 Innovative technology, costs are generally higher than market price of water, moderate time frame to implement.
- 4 Can be implemented fairly quickly, cost effective, common technology.
- 5 No impediments, quick, very cost effective, already being done.

Physical, hydrological, and environmental aspects

- 1 Will lose some water, (e.g. increases evaporation), highly detrimental environmental effects, degrades water quality.
- 2 Potential to lose water, negative environmental effects, potential to degrade water quality, significant infrastructure requirements.
- 3 Does not necessarily gain water or improve water supply management. No significant environmental impacts, does not improve or impair water quality, moderate infrastructure requirements.
- 4 Results in some water savings, potential to enhance natural environment, may improve water quality. Few infrastructure requirements.
- 5 Results in significant water savings, environmental enhancements, and improves water quality. No infrastructure requirements or highly feasible infrastructure requirements.

Economic impacts

- 1 Economic impacts are borne solely by the region, without state or federal assistance.
- 2 Economic impacts are borne by the region, with minimal outside assistance.
- 3 Economic impacts are borne by the region with some state funding of the alternative.
- 4 Significant amount of funding will come from state and federal resources. Region will contribute minor portions. Beneficial to regional economy.
- 5 Majority of funding will come from federal and state sources outside the region, with region gaining significant economic benefit. Highly beneficial to regional economy.

Social and cultural implications

- 1 Unacceptable to broad range of social groups.
- 2 At least one social group will oppose the alternative.

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- 3 Advantages and disadvantages are in equilibrium.
- 4 Generally acceptable to most social groups, some resistance may still occur.
- 5 Acceptable and desirable for most social groups.

#### Legal implications

- 1 Very difficult change in existing federal/interstate law; high risk that any proposed change to such existing law would not be successful, not in compliance with Compact, permit applications precedent-setting approval not likely within planning period.
- 2 Possible to change law, but difficult due to political opposition; lengthy process to make legal change, Compact issues, permits are extensive, technically complex, and may require entire planning period to obtain approval. Few permits, if any, exist for similar projects.
- 3 Possible, more routine, less controversial legal change; still may involve complex approval requirement; may involve potentially novel concept, significant permitting efforts, but some similar permitting has been achieved.
- 4 Minimal legal barriers; local or regulatory change already supported by statute, permitting process lengthy, but similar projects already permitted.
- 5 No legal barriers/already occurring; permitting routine.

The political feasibility for each alternative was assessed via a survey of elected officials with jurisdiction in the regional water planning area. Because local government officials have the authority to ultimately carry out a local water management program, the elected officials were asked to consider whether there might be local support or opposition to the alternative, potential interagency conflicts, and what the means of implementation might involve. Like the other feasibility scores, a 1 meant that the alternative had low feasibility and a 5 meant that the alternative was highly feasible. Table 8-1 shows the results of these rankings.

### **8.3 Public Preferences Among Alternative Actions**

In September 2002 the Water Assembly hosted Community Conversations Series 5 where attendees had the opportunity to select their four “most liked” and four “least liked” alternative actions. The “voting” process consisted of posting all 44 alternative actions on large sheets of paper on the walls during the meeting and giving all attendees four blue dots to stick next to their “most liked” alternatives and four black dots to stick next to their “least liked” alternatives.

Prior to the community conversations the Water Assembly mailed a booklet describing all alternative actions (see Supporting Document E-1) to their entire mailing list and asked that people review the alternatives before attending the community conversations. The booklet included a postcard that allowed people to “vote” by noting their most and least preferred alternatives on the card and mailing it back to the Water Assembly. The results from the “dot voting” and the “card voting” were tallied and ranked. Table 8-1 shows the rank order for the alternatives, with a “1” meaning it was the most liked alternative. Supporting Document E-4 provides a more detailed summary of the public preference ranking for the alternatives.

**Table 8-1 Summary Table of Feasibility Ratings and Preferences**

Remember that the ratings for the feasibility scores range from 1 = low feasibility to 5 = high feasibility. The numbers in the Preference Rankings columns reflect the rank order determined by how many “most preferred” votes that alternative received from the public. For example, alternative A-66, Watershed Plans, ranked 41<sup>st</sup> in terms of the “most preferred” votes received at the Community Conversations and the 32<sup>nd</sup> most votes from the mail-in cards. Alternative A-1, Bosque Management, receive the largest number of “most preferred” votes at the Community Conversations and hence was ranked a “1” in this table. Alternatives can have the same ranking if they received an equal number of votes. Note that in the feasibility columns a 5 is the highest rating while in the public preference columns a 1 is the highest ranking.

Id #	Alternative Action	Definition	Feasibility Ratings						Preference Rankings	
			Tech	P, H, E	Econ	Soc/Cul	Legal	Political	CC #5	Cards
Increase Water Supply										
A-66	Watershed Plans	Implement local and regional watershed management plans through all land and water agencies in the planning area.	4	4	4	4	3	3.8	41	32
A-1	Bosque Management	Restore bosque habitat and manage vegetation in the bosque to reduce evapotranspiration by selectively removing vegetation and promoting native plants.	4	5	4	5	5	4.5	1	3
A-45	Reservoir Management	Reduce open water evaporation in storage reservoirs (e.g. by retaining water at higher elevations or latitudes, or by reducing surface areas).	4	4	4	2	2	3.9	5	1
A-38	Surface Modeling	Increase monitoring and modeling of surface water system to improve water management at the watershed level, and retain excess water flow from Elephant Butte Reservoir during wet cycles.	5	3	5	5	5	3.9	19	23
A-46	Aquifer Storage	Inject water treated to drinking water standards for aquifer storage and recovery (ASR) in appropriate locations throughout the water planning region.	4	4	4	3	3	4.1	12	21

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A-24	Reuse Greywater	Promote, through incentives, on-site residential and commercial greywater reuse and recycling.	3	2	2	3	3	4.2	9	7
A-27	Reuse Treated Effluent	Reuse treated wastewater for non-potable uses.	3	3	3	2	4	4.6	7	9
A-39	Desalination	Utilize technological advances for treating deep saline and brackish water for potable or non-potable use in the region.	2	4	3	3	3	3.2	29	18
A-69	Importation of Water	Acquire additional water rights without condemnation from various sources from within or outside the water-planning region, and import water from other basins where possible.	4	4	4	2	3	2.8	26	21
A-44	Water Harvesting	Encourage on-site rainwater harvesting.	5	3	3	3	5	3.2	12	18
A-33	Soil and Vegetation Management	Establish erosion prevention measures and use soil and vegetation management techniques to reduce runoff and increase infiltration throughout the watershed, including forested mountains and uplands.	4	3	4	5	4	4.1	13	15
A-2	Vegetation Removal Products	Develop the economic potential of non-native species removal, harvesting, and output of products by local industries.	2	4	4	4	5	3.5	44	36
A-34	Storm Water Management	Enhance and expand local government storm water plans and programs to control runoff using swales, terraces, and retention structures to minimize erosion, enhance infiltration and recharge, and prevent pollution of surface and ground water.	4	3	3	5	5	4.0	29	36
A-40	Vegetation Management	Continue evapotranspiration studies and apply findings to vegetation management programs in the water planning region.	5	3	4	4	5	3.1	34	42

A-36	Wetlands	Create constructed wetlands where feasible for groundwater recharge, water harvesting, and habitat improvement, and hydrological management of the Rio Grande.	2	1	1	3	3	2.5	23	32
A-42	Weather Modification	Conduct research on innovative water supply enhancement techniques such as weather modification.	5	3	3	3	5	2.6	38	44
Decrease or Regulate Water Demand										
A-18	Urban Conservation	Adopt and implement local water conservation plans and programs in all municipal and county jurisdictions, including drought contingency plans.	4	5	3	4	5	4.2	3	5
A-21	Urban Water Pricing	Examine a variety of water pricing mechanisms and adopt those that are most effective at conserving water.	5	3	2	3	5	3.1	13	9
A-22	Conservation Incentives	Provide local government programs that offer incentives for adoption of water efficient technologies and utilization of water saving devices.	5	5	3	4	5	3.7	13	29
A-56	Education	Establish region-wide educational programs, including public and private school curricula, to encourage voluntary conservation of water.	5	5	4	4	5	4.7	19	16
A-10	Irrigation Efficiency	Develop and employ alternatives to maximize irrigation efficiency on all irrigated land in the region.	4	4	3	2	5	3.6	7	9
A-7	Agricultural Metering	Meter and manage surface water distribution flows through all irrigation systems to conserve water.	4	4	3	1	5	2.7	19	12
A-9	Conveyance Systems	Develop conveyance alternatives for water transportation in agricultural irrigation systems.	5	4	3	2	5	3.1	23	16
A-8	Metering Water Supply Wells	Meter all water supply wells, including domestic wells, throughout the water-planning region.	3	4	1	2	4	2.9	18	12

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A-61	Domestic Well Controls	Reduce the allowed pumping from domestic wells and restrict drilling of domestic wells where surface waters or the aquifer could be impaired.	4	4	3	2	2	2.8	38	36
A-60	Acequia Conservation Programs	Fund irrigation organizations to develop and implement water conservation programs.	5	4	4	5	5	3.4	19	23
Change Water Uses to Increase Supply/Decrease Demand										
A-11	Low-Water Crops	Develop markets for locally-grown produce, and low-water alternative crops.	2	4	4	5	5	3.1	17	23
A-30	Land Use	Adopt policies to integrate land use planning and water resource management in all government jurisdictions in the Middle Rio Grande water planning region.	4	5	2	5	3	2.7	2	1

## **Chapter 8 References**

Alternatives Working Team of the Middle Rio Grande Water Assembly. Handbook on Analysis Methodology for Regional Water Management Alternatives, April 2001 (funded by the New Mexico Interstate Stream Commission).

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