7

Current Water Demand and No-Action Future Water Demand

This chapter presents the demand for water resources in the Middle Rio Grande Region (MRG Region). The data presented in this chapter assumes that no public policy changes are instituted as a result of the planning process. The effects of changes to public policy (know as "alternatives") are presented in Chapters 8 and 9. This chapter covers the following topics:

- Present and Historic Water Uses
- Future Water Uses for a 50-Year Planning Horizon
- Future Water Use for a Seven-Generation Planning Horizon (deferred)
- Water-Use Reduction Targets per Sector
- Balancing the Budget Across Jurisdictions

7.1 Present and Historic Water Uses

As part of this planning process, the Middle Rio Grande Water Assembly (Water Assembly) and the Mid-Region Council of Governments (MRCOG) used some of the funds from the Interstate Stream Commission (ISC) to document current and historical water use in the region. Refer to Appendix C-7 for the executive summary from this report and information on obtaining a complete copy of the report (Nims et al. 2000).

Highlights from that report include how water is used throughout the entire region (Figure 7-1) and how use is distributed among the three counties covered in this plan (Figure 7-2).

7.2 Future Water Uses for a 50-Year Planning Horizon

Any effort to predict what water demand will be over multiple years represents little more than an author's best guess. Supply rates fluctuate dramatically from year to year, decade to decade, and from century to century. Migratory, economic, and consumptive behavior of people is similarly uncertain. Any planning effort, however, needs to establish a reference from which decisionmakers can adopt and implement actions to either move toward or away from some predicted future reality.

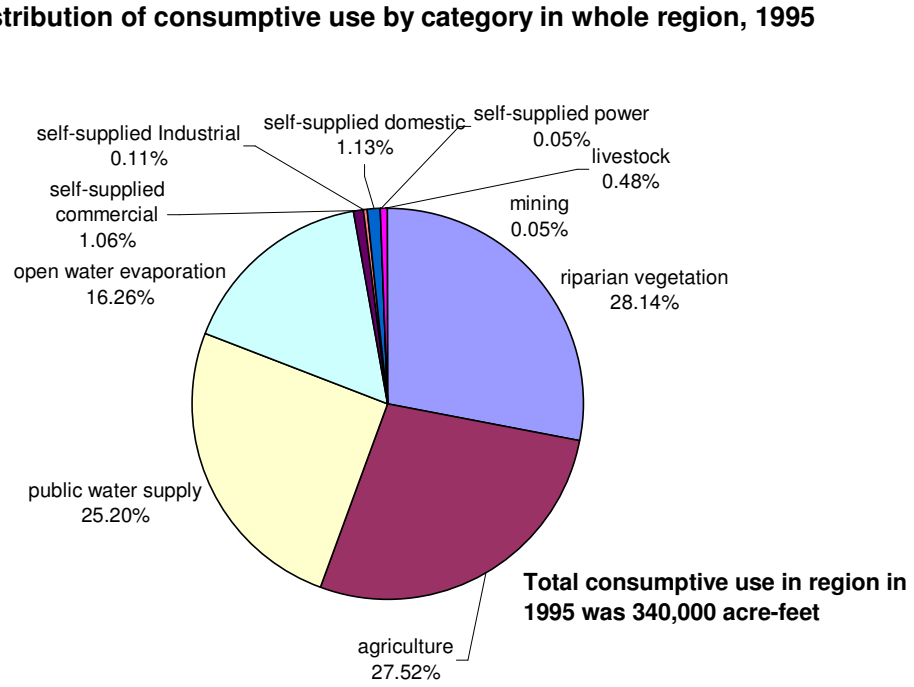
The MRCOG, working with funding from ISC, developed a conjecture of what the region's future might look like. Refer to Appendix C-4 for the executive summary from this report, Future Water Use Projections for the Middle Rio Grande Water Planning Region (FWUP) (MRGCOG 2001).

This report presents a "status quo" future water situation, meaning that if current water-use practices continue and if there are no significant policy changes or actions taken, this is what the future could look like. It is against this baseline that decisionmakers and the public can evaluate the effects of possible changes to the recent historical use and public policy.

In reality the limited water resource unequivocally prevents continuing on the present course. It is important to understand that this future baseline model presents an unrealistic picture of possible future use.

Based on technical assessments and public dialogue, individuals and organizations involved in creating this plan recommend changes to water-related behavior and public policies. Participants in the planning process evaluated the scenarios (Chapter 9) and recommendations (Chapter 10) developed by the Water Assembly by considering their perturbation to this future baseline, as well as their social, environmental, legal, economic and other effects.

Figure 7-1 Percentages of consumptive use by category in the Middle Rio Grande Region. (Source: Nims et al. 2000)



The FWUP calculates that continuing on the present course would drive the average annual net deficit (renewable minus consumptive) of wet water from 55,000 to 150,000 acre-feet per year in just fifty years, over five million acre feet of cumulative water mining in the period. Table 7-1 shows the predicted withdrawals for various users assuming a "status quo" management option.

In spring of 2004, the official Biological Opinion regarding the silvery minnow indicates that there is a new requirement for an average additional 50,000 acre feet per year of Rio Grande flow. The implications of this new requirement on the Regional Water Plan have not been evaluated.

7.3 Future Water Uses for a Seven-Generation Planning Horizon

This section was deferred beyond the current water planning process due to resource limitations.

7.4 Water-Use Reduction Targets per Sector

At the end of 2001 and following into the spring of 2002, the Water Assembly began to work on what came to be called the water balancing exercise (WBE). The purpose of this exercise was to come up with a set of water-use numbers that would set targets for balancing the water budget by 2050.

In December 2001, five constituency groups (CGs) were formed, each representing a particular set of values. The CGs were given the baseline numbers and were instructed to make scenario of a set of targets for each sector based on that group's values. Two of the CGs came up with two scenarios based on different sets of assumptions.

Following is a statement of each group's interests as developed for the 6th Annual Water Assembly in 2002, and based upon the 4th Series of Community Conversations:

Agricultural, Cultural and Historic Water Use Advocates (AC&HWA)— Farming has been practiced in New Mexico for over a thousand years. Long before the Pilgrims arrived at Plymouth Colony, herding and ranching were being practiced here. New Mexico has always been an agriculturally based society and our history and cultures are founded on it. Today, America loses over 1 million acres of farmland a year to urban sprawl, and New Mexico is no exception. The AC&HWA CG seeks to preserve agricultural practice, economies, lifestyles, and water rights through water planning. As noted in Chapter 6, agriculture (excluding riparian) consumes about one third of the water consumption within the region.

Managers' Advocates (MA)—The MA CG is made up of, as its name describes, organizations that are responsible for obtaining and distributing water to ultimate users of water. Members can include government-owned and investor-owned water utilities, cooperative water utilities, and other organizations and associations that manage water for the benefit of their customers or members that are end users of water. The MAs did not create a scenario for WBE.

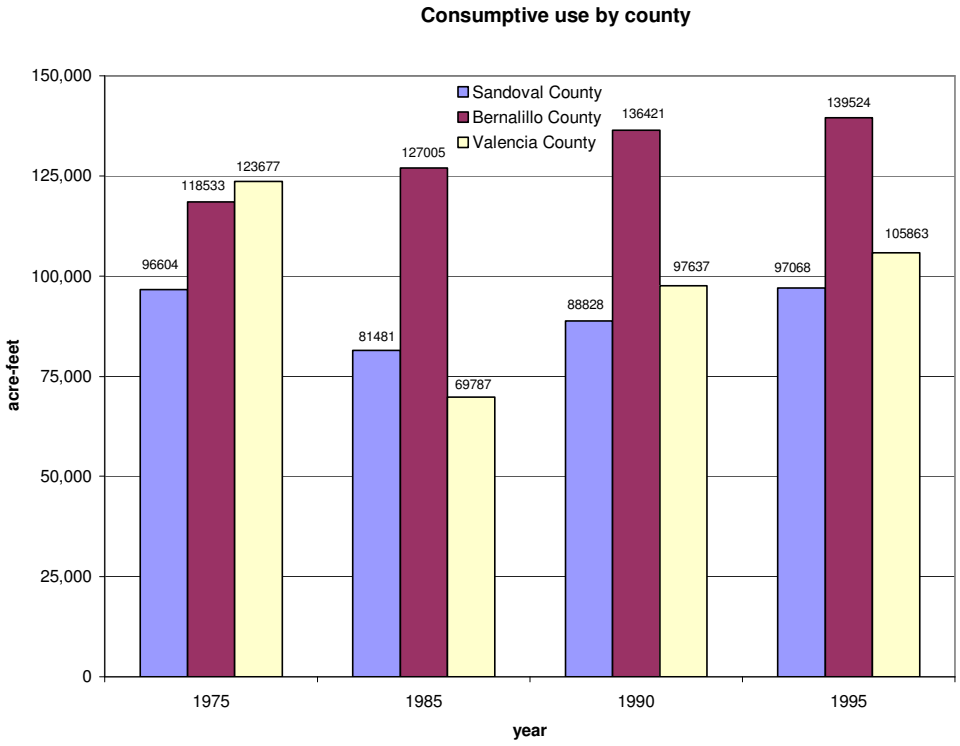
Specialists Constituency Group (SCG)—This CG consists of professionals who have specialized in the water resource field as a matter of training or practice, e.g. hydrologists, hydrogeologists, engineers, ecologists, economists, lawyers, and other pertinent disciplines.

Environmental Advocates (EA)—The EA CG is charged with advocating for a water plan that incorporates environmentally sustainable water-use practices such as the maintenance and increase of riparian areas, keeping the river wet, and the survival of the Rio Grande's unique riverine habitat.

Urban Users and Economic Development Advocates (UUEDA)—The UUEDA CG supports sensible water planning to sustain an urban life style, a healthy economy in the rural and urban regions, and a quality of life which includes preservation of open-space. This group promotes a conservative use of water and recognizes its responsibility

Figure 7-2 Consumptive use of water by county (Source: Nims et al. 2000)

Sources: 1975--no data for self-supplied commercial, self-supplied domestic, and mining



1985--open water evaporation 1975 data; no data for self-supplied domestic

1990--open water evaporation 1993 data

1995--open water evaporation 1993 data; riparian consumptive 1994 data

Table 7-1 Projected withdrawals at 10-year intervals for the planning region (Source: MRGCOG 2001)

	Withdrawals (acre-feet)					
Land-Use Category	2000	2010	2020	2030	2040	2050
Single-family residential	108,557	146,451	179,297	205,803	232,265	261,680
Multi-family residential	10,000	11,670	13,117	14,285	15,451	16,747
Major retail commercial	2,451	2,658	2,837	2,982	3,126	3,287
Mixed and minor commercial	19,149	23,382	27,051	30,012	32,967	36,253
Office	2,042	3,001	3,832	4,502	5,172	5,916
Industrial and wholesale	5,865	6,535	7,116	7,585	8,053	8,573
Institutions	1,602	1,690	1,767	1,829	1,890	1,959
Schools and universities	3,069	2,979	2,900	2,837	2,774	2,704
Airports	5,123	4,894	4,696	4,536	4,376	4,198
Transportation and major utility corridors	591	570	552	537	522	506
Irrigated agriculture	281,934	265,568	251,383	239,936	228,508	215,804
Rangeland and dry agriculture	0	0	0	0	0	0
Major open space and parks (with water use)	5,001	4,795	4,616	4,471	4,327	4,167
Major open space and parks (no water use)	0	0	0	0	0	0
Natural drainage and riparian systems	148,140	148,198	148,248	148,288	148,328	148,373
Urban vacant and abandoned	0	0	0	0	0	0
Landfills and sewage treatment plants	2,131	2,164	2,193	2,216	2,239	2,265
Other urban non-residential	1,347	1,697	2,001	2,246	2,490	2,762
Kirtland Air Force Base	3,000	3,002	3,004	3,005	3,006	3,008
Totals:	600,002	629,254	654,608	675,069	695,496	718,202

to preserve water for all uses—urban, agricultural, and environmental—within the region. It incorporates the interests of developers and rural economic promoters, together with those of apartment dwellers, home-owners and business. The UUEDA CG is made up of individuals with diverse backgrounds and is always looking for input from the community at large. If you have a home or a business within the region, we encourage you to come join our group!

7.4.1 Baseline Numbers

With the release of FWUP by MRGCOG in 2001, anticipated future water-use numbers could now be added to the data collection that included historical water use and current water use in the region. The challenge then became, "how to bring the information from the three sources together in a useful way?"

The AT reviewed and synchronized the numbers and came up with two sets of numbers, current use and future no-change use in 2050. This proved to be a complex task as the three primary data sources each categorized water use in different ways.

- The original Water Budget listed ground-water mining at 70,000 afpy. This number was subsequently adjusted to 55,000 afpy. The 26-year average, which was the basis of the 70,000 afpy number, did not take into account that during those years, about 15,000 afpy of the San Juan-Chama Project diversion was being used to fill the Heron Lake reservoir. This 15,000 afpy would have been available to contractors, had they called for it.
- An adjustment was made after it was pointed out that the Middle Rio Grande Conservancy District's (MRGCD) estimate of agricultural acres differed from the number used by FWUP. The FWUP set out 36,377 acres for current agriculture use, and estimated that 28,720 would be so utilized in 2050. According to the U.S. Department of Agriculture, MRGCD, and the Bureau of Reclamation, current irrigated acres are much higher—in the neighborhood of 48,000 acres. Using the percentage difference shown in FWUP but not the actual acreage, the decision was made to use 36,000 for the future irrigated acres (MRGCOG 2001).
- Three categories from the Water Budget, (gauged) Tributary Inflow, Deep Ground-water Inflow, and Mountain-Front and Tributary Recharge, were combined under the single WBE category Tributary and Ground-water Inflows.
- The Water Budget claims 90,000 afpy for all consumed ground water. However, for purposes of the WBE, this was split into two categories, Domestic Uses; and Office, Business, Commercial, and Industrial Uses. The amount was split 64% to 36%, respectively.
- Current and expected population numbers come from FWUP. The numbers of current and future expected jobs in the region were taken from Bureau of Business and Economic Research (BBER) data (BBER 2001).

The AT faced challenges to the numbers, which resulted in numerous revisions. In part this resulted as new people got involved in the middle of the WBE process, who had no understanding of the origin, who brought new insights and/or who brought new information to the originally agreed-upon numbers. .In the long run, challenges to the baseline numbers resulted in better numbers. However, the changes made the WBE itself was a long and torturous process. In fact, as late as summer 2003, long after the conclusion of the WBE, several of the basis numbers were still being disputed, notably the number of acres undergoing agricultural irrigation, and the number of acres of riparian vegetation.

7.4.2 No-Action Year 2050 Usage

The no-action numbers came from three sources. In some cases it was assumed that if no action were taken, the current numbers would not change. In other cases, for instance, urban water use, an adjustment was made based on a projected increase in population. Adjusted numbers were taken from FWUP for Irrigated Agriculture Uses; Office, Business, Commercial, and Industrial Uses; and Domestic Uses. Population growth numbers were taken from BBER data (BBER 2001).

7.4.3 Water Deficit

The current use budget (see Chapter 6) shows an adjusted annual deficit of 55,000 afpy. The annual projected no-action 2050 usage *deficit* is estimated at 150,000 afpy. The challenge was to find a way to reduce the current and future deficits to zero. In addition to adjusting the amount of water to be used in each category from the water budget, teams were given the option of eliminating evaporative loss from Elephant Butte reservoir or of importing water from the Socorro-Sierra Region or from another source; however, the team had to specify what that other source would be.

The results of continuing to add annual deficits to the accumulated debt of approximately half a cubic mile, or 1.7 million acre feet, is illustrated in a recent USGS report. "The recent (1999 to 2002) water levels presented in this report indicate that beneath the Albuquerque metropolitan area, ground water on either side of the Rio Grande currently flows toward the major pumping centers from all directions" (Bexfield and Anderholm 2002).

7.4.4 Instructions to Participants

Each Constituency Group tackled the exercise, trying to balance the water budget from their interests' perspective. They were provided with the instructions how to do the exercise (Supporting Document I). In addition to details about each of the water categories in the exercise, participants received nine bullet points drawn from the Middle Rio Grande Water Supply Study, reproduced here:

> Key water supply and hydrologic concepts illustrated or derived from this study, with implications for water planning are:

- On average, *the present water supply is barely adequate* (including San Juan-Chama Project water and groundwater withdrawals) to meet the present demands in the Middle Rio Grande region.
- *The water supply is highly variabl*e, due to the high variability in Otowi inflow and the high variability in evaporation from the Elephant Butte Reservoir.
- Given the variability of water budget terms, Rio Grande Compact debit conditions are expected to occur nearly as frequently as credit conditions.
- *Under conditions of increased water use in any sector, a reduction of water use from other sectors is requi*red to maintain overall water supply balance, and to avoid increasing the likelihood of incurring Rio Grande Compact debits.
- The groundwater supply is not an independent, disconnected water supply. *Use of ground water results in diminished flows of the Rio Grande* that will occur in the present and continue into the future.
- The location of groundwater well fields affects short-term timing of impacts to the river; however, regardless of location, the impacts of ground-water pumping eventually reach the river and require offset.
- Recharge of groundwater from the stream system reduces the flow of the Rio Grande available to meet obligations under the Rio Grande Compact.
- *The water supply from Otowi to Elephant Butte is essentially a single supply*; water use in every sub-region of the Middle Rio Grande affects the water available to the entire region.
- *The water supply is only depleted by consumptive us*e; reductions in diversions and return flows resulting in better delivery efficiency do not necessarily improve the water supply.

In summary, the water supply of the Middle Rio Grande is marked by limitation and variability. The successful water planning process will operate in recognition of these concepts (S. S. Papadopulos & Associates 2000).

7.4.5 Specialists' Scenarios

The SCG came up with two scenarios. They began by using a low population series from Appendix A in FWUP(MRGCOG 2001) in preparing the Minimum scenario and then lowered all water-use coefficients across the board to the minimum they thought practicable. They also relocated a substantial amount of Elephant Butte storage to reduce evaporation losses (Table 7-4).

Because that scenario produced a "surplus," they experimented with a higher population series which they called the Maximum scenario. This scenario produced a deficit which was made up through importations from Socorro-Sierra Region (Table 7-5).

7.4.6 Agricultural Users Scenarios

The AC&HWA developed two scenarios. Scenario I reflects the overall values of the agricultural users in desiring to preserve farming in the region. Scenario II showed the savings that could be gained by freezing all urban use at its current level. This would be accomplished by establishing strict conservation measures throughout the region and finding a way (not specified) to freeze job and population growth (Tables 7-6 and 7-7).

7.4.7 Environmental Scenario

The priority in the EA's scenario is to preserve the riparian environment, if necessary, at the expense of growth (Table 7-8).

7.4.8 Urban User and Economic Developers Scenario

The UUEDA used a balanced approached requiring more efficiency out of all water users while maintaining a high quality of life, and accommodating expected increases in population (Table 7-9).

7.4.9 The Water Balancing Model

The Cooperative Modeling Team (CMT) along with Sandia National Laboratories developed a software program that attempted to reflect the interaction among the categories of inflow and use. The program could be used to show how increases or decreases in water use in various sectors would affect the overall water budget (Figure 7-4). The early version of this model is known as the "mini model." The later version is called the Middle Rio Grande model (MRG model). This program became the vehicle for presenting water balancing to the public.

The "mini model" was presented at the 4th Series of Community Conversations held in March, 2002, in Albuquerque, Rio Rancho, and Los Lunas.

Attendees were divided into several teams, each with their own copy of the model. Each group was encouraged to adjust the usages of water to achieve an overall balance. The resulting balanced budgets (or unbalanced budgets) were presented to the whole group along with an explanation of the changes chosen.

Perhaps the most striking realization by participants in this process was that if the open water evaporation from Elephant Butte Reservoir were eliminated, it would balance the water deficit. (Unfortunately, storage of the water is governed by the Rio Grande Compact, which could only be changed with great political difficulty.)

7.4.10 The Sixth Annual Assembly

The results of the CCs were reviewed by the CGs, who used the input to modify their initial positions. The modified results were presented at the 6th Annual Assembly in 2002.

7.4.11 A Balancing Act

The Water Assembly never agreed upon a single, final target set of numbers. Rather, the CGs presented their scenarios. Results of the balancing exercise are presented in Supporting Document I. Figures 7-5 and 7-6 and Table 7-10 summarize the results. Interestingly, when each scenario's numbers are viewed as a percentage of their entire budget, the percentages do not differ widely.

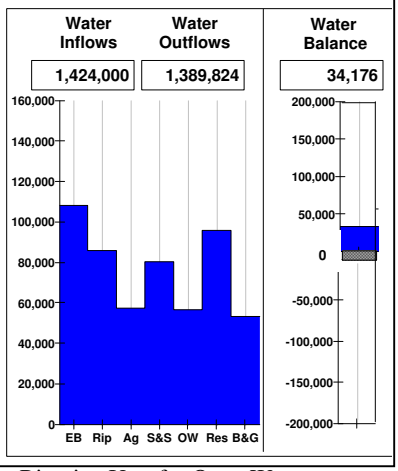
7.4.12 Conclusions on Balancing Exercise

The WBE was intended as a first step toward balancing the water budget. The exercise showed just how hard it was to balance the budget given the constraints present in the region. It also showed how a balanced budget might be obtained in different ways depending on the values applied to the process.

Figure 7-4 Sample of a Balanced Budget (Source: The Middle Rio Grande Water Assembly)

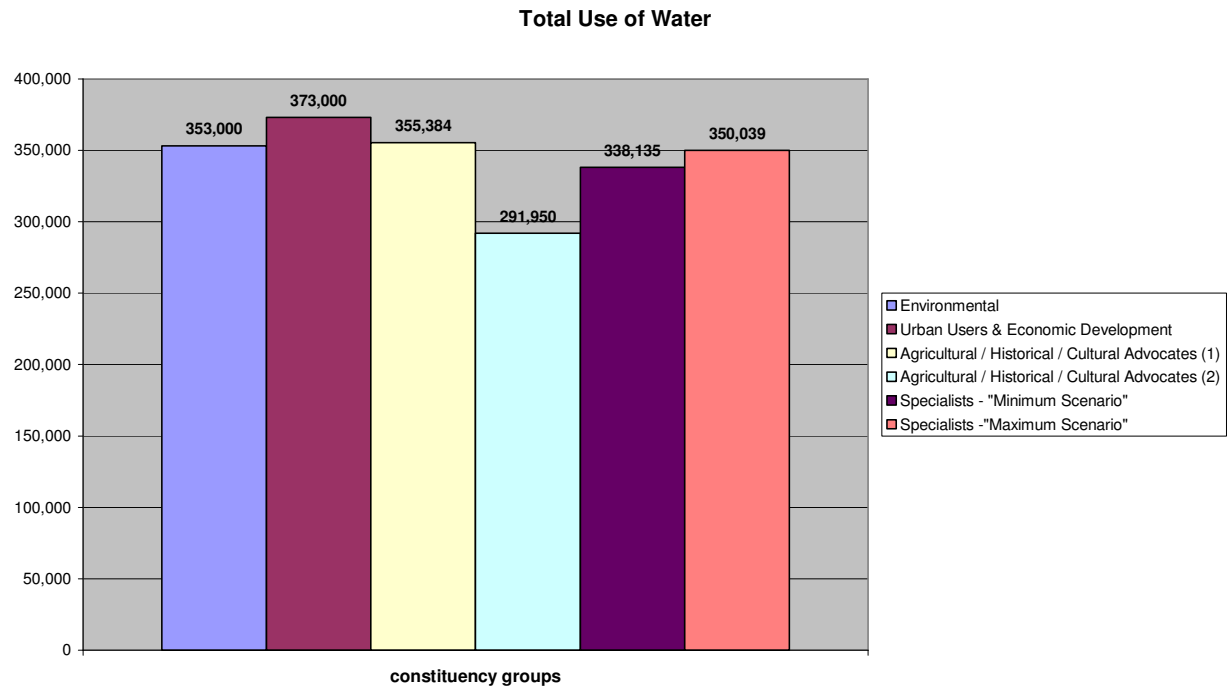
Totals

	Units	Units, % of 25-yr. avg.	Per Unit Use	Per Unit Use, % of 25-yr. avg.	Sub-total	Sub-total, % of 25-yr. avg.
Rio Grande Compact					850,000	
Elephant Butte Evaporation	12,057	75%	9.00	100%	108,511	75%
Socorro & Sierra Deliveries					80,482	80%
Riparian Use	36,000	80%	2.39	80%	86,123	64%
Open Water Evaporation	11,375	95%	5.00	100%	56,875	95%
Irrigated Agriculture	34,622	72%	1.67	80%	57,932	58%
Business & Government	706,844	206%	0.08	79%	53,752	163%
Residential Uses	1,500,000	210%	0.06	80%	96,148	169%



NOTE: "Units" in the model were: acres for Elephant Butte Evaporation, for Riparian Use, for Open Water Evaporation and for Irrigated Agriculture; jobs for Business and Government, and population for Residential Uses.

Figure 7-5 Total Use of Water (Source: The Middle Rio Grande Water Assembly)



During the course of the WBE, the usefulness of the "mini-model" became apparent. With the model the balancing implications of assignments to sectors could be immediately viewed and in a format that is easy for the general public to understand.

In the end, a single set of numbers by sector was not arrived at; rather, each of the approaches presented an alternative vision of how to tackle the problem. Despite the differences in approach to each WBE calculation, the results reveal a surprising similarity in the *percentage* of water that could be devoted to each sector (Table 7-2). Considering that all the numbers used in the exercise are approximations, the similarity of the results is encouraging. It means that all the various interests see the solution within a calculation that approximates water use of the same order of magnitude by sector.

7.5 Balancing the Budget Across Jurisdictions

In addition to category-of-use sectors—Elephant Butte Lake Evaporation, Riparian Uses, etc.—whose balancing reflect the values of the community within the region (Table 7-2), the region has jurisdictional sectors, identified by incorporated governmental entities, special districts, and county non-incorporated areas. In some cases, the bounds of these jurisdictions can be more easily measured by the relevant water utility systems or acequia and ditch supplier systems.

Through this regional water planning process, local government jurisdictions are working toward a mechanism to achieve and maintain the balance of use with renewable supply. The government jurisdictional representatives in the MRG Region have concurred on a set of principles that may lead to establishing consumptive water use budgetary goals for the jurisdictions within the region. This budgeting would be an average long term target ceiling on consumptive use within the region, moderated by an equitable sharing of any additional renewable supplies (e.g., through import or evaporation suppression). At a meeting held September 10, 2003, the Water Resources Board concurred on the following principles (see Historical Archives D-3):

> Principle Policy I: Ground Water
>
> We encourage adoption and implementation of policies that conserve use of ground water in the Middle Rio

Table 7-2 Percentage Use by Sector (Source: The Middle Rio Grande Water Assembly)

Percentage of Total by Category-of-use Sector	Elephant Butte Lake Evaporation	Riparian Uses	Open Water Uses (Other than EB)	Irrigated Agriculture Uses	Office, Business, Commercial, and Industrial Uses	Domestic Uses
Constituency Group						
Current Usage	27%	26%	11%	19%	6%	11%
Future Usage (FWUP)	25%	23%	10%	12%	9%	20%
Environmental	26%	30%	10%	14%	7%	12%
Urban Users & Economic Development	24%	27%	10%	13%	10%	17%
Agricultural / Historical / Cultural Advocates (1)	25%	27%	11%	20%	0%	18%
Agricultural / Historical / Cultural Advocates (2)	33%	26%	14%	14%	4%	9%
Specialists - "Minimum Scenario"	22%	25%	14%	14%	10%	16%
Specialists -"Maximum Scenario"	29%	22%	12%	12%	11%	14%
Percentage Range	22-33%	22-33%	10-14%	12-20%	6-11%	11-20%

Grande subregion to create a reserve to deal with drought, prevent subsidence and mitigate other negative effects of ground-water depletion.

Principle Policy II: Surface Water

We encourage adoption and implementation of policies that conserve use of surface water. Any additional water that is available should be stored upstream and/or returned to the aquifer using appropriate technology. This principle is to reduce evaporative losses.

Principle Policy III: Designing Implementation Mechanisms

We encourage jurisdictions in the region to work together to design implementation mechanisms for the plan that are effective, fair, wise, equitable, legal and appropriate to local community concerns**.**

The mission of balancing water use with renewable supply in the region is a responsibility to be shared equitably on a long-term average among jurisdictions. Accordingly, it is anticipated that the jurisdictions will need to establish a fair and equitable means for sharing the task of bringing the region into a balance between consumptive use and renewable supply. Each jurisdiction should play its part in accomplishing this through a variety of mechanisms that guide the consumptive use of water by water-rights holders and others within their jurisdiction.

In the process of working and sharing among jurisdictions in a fair and equitable way to bring the region back into balance, there are several aspects that the jurisdictions would need to consider, all within the context of encouraging water rights holders within the existing priority system.

7.5.1 Sharing of Conservation Needs

One of the components of sharing the balancing of the budget is in setting goals for determining how intensely each jurisdiction should encourage its constituents to conserve in their consumptive use of water. Example criteria for fair and equitable division of the conservation obligation among jurisdictions could include the recent historical

consumptive use by the jurisdiction, the population of the jurisdiction, or the claimed water rights within the jurisdiction, and efficacy of their recent conservation efforts.

7.5.2 Sharing of Additional Water

A second consideration in deciding how to balance the consumptive use with renewable supply is choosing the fair and equitable way of crediting each jurisdiction's incentive program and budget with water that is saved through a pan-jurisdictional action (e.g., evaporative suppression). Example criteria for fair and equitable division of the credit among jurisdictions for such an action could include the recent historical consumptive use by the jurisdiction, the financial contribution by the jurisdiction to the saving project, or actual conservation success by the jurisdiction since the acceptance of the plan.

7.5.3 Sharing of Uncontrollable Impositions

Another consideration is dealing with changes in water policy over which the jurisdictions within the region have neither control nor influence. Examples could include settlements of various claims for water and endangered species rulings by the federal judiciary. Any such occurrence could affect prior decisions on the fair and equitable sharing principles that the jurisdictions might have established. It would be advisable for the jurisdictions to have established fair and equitable criteria for sharing any goal changes that would stem from such uncontrollable impositions. Examples of criteria could include tribal space within the jurisdiction, historical consumptive use within the jurisdiction, or actual conservation success by the jurisdiction since the acceptance and implementation of the plan.

7.5.4 Adjustment of Sharing Decisions

The sharing decisions that are initially made as goals among the jurisdictions may later prove to be less than ideal. It is anticipated that jurisdictions could exchange conservation methodologies as time goes on.

7.5.5 Monitoring the Balancing Process

Once the sharing criteria have been determined, an ongoing measurement program within each jurisdiction and across the region needs to identify how well the region is moving toward a balance between consumptive use and renewable supply. Such data should be made generally available.

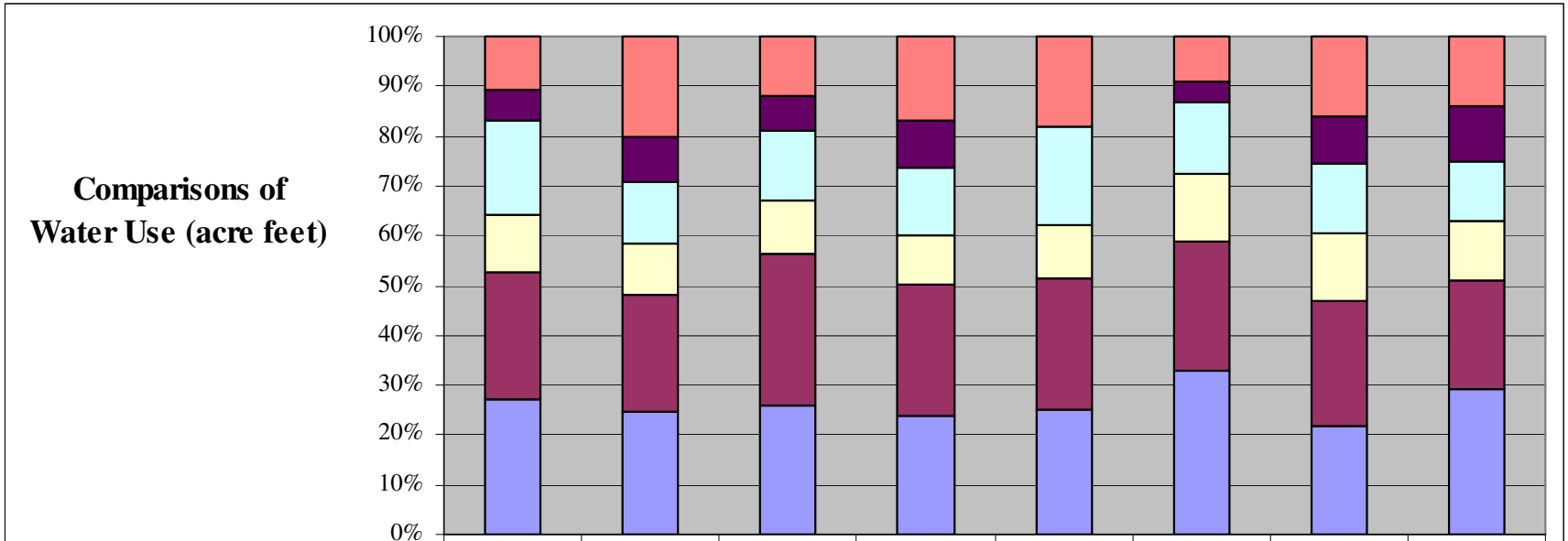
7.5.6 Baseline Data for Balancing

For the purpose of providing information to help the jurisdictions through the Water Resources Board to establish fair and equitable means for sharing, Table 7-3 lists estimates of recent historical consumptive uses and populations by jurisdiction. Data values in the table are from the late 1990s (somewhat different from the last quarter century water budgeting cited in Chapter 6 because of differences in baseline data time window, and other attributes) and were drawn or estimated from various sources. The analysis used data from Wilson (2000) and OSE (2003) to develop the numbers used in this plan (see Supporting Document O).

Table 7-3 Estimated population and current consumptive use by major Middle Rio Grande Region jurisdiction excluding Rio Puerco and Rio Jemez subregion municipalities. Consistency of consumptive use data with the extensive appendices in the Shomaker report is to be verified in update cycles during 2004. Note that Pueblo use is unknown and has been removed from this table. (Source: The Middle Rio Grande Water Assembly)

Water Related Jurisdiction	Estimated Current Population	Estimated Current Consumptive Use (afpy)
VALENCIA PUEBLO	unknown	unknown
LOS LUNAS WATER SYSTEM	11,155	1,149
BELEN WATER SYSTEM	9,780	1,237
BOSQUE FARMS WATER SUPPLY SYSTEM	4,000	244
VALENCIA UNINCORPORATED	46,113	4,595
VALENCIA MRGCD IRRIGATION		68,064
VALENCIA RIPARIAN		33,672
TOTAL VALENCIA	71,048	108,961
SANDOVAL PUEBLO	unknown	unknown
CITY OF RIO RANCHO	56,000	5,674
BERNALILLO WATER SYSTEM	7,000	603
ALGODONES WUA	765	54
CORRALES VILLAGE	50	5
DOMESTIC WELLS-CORRALES SELF SUP HOMES	7,284	1,223
SANDOVAL UNINCORPORATED	23,072	2,284
SANDOVAL IRRIGATION-MRGCD		14,813
IRRIGATION-ACEQUIAS		5,242
RIPARIAN		17,126
INTEL		979
TOTAL SANDOVAL	94,171	48,003
BERNALILLO PUEBLO	unknown	unknown
ALBUQUERQUE WATER SYSTEM	445,000	51,069
KIRTLAND AIR FORCE BASE	5,700	2,061
UNIVERSITY OF NEW MEXICO		2,939
NEW MEXICO UTILITIES INC	14,000	1,607
VILLAGE OF TIJERAS	350	41
BERNALILLO UNINCORPORATED	64,666	6,947
BERNALILLO IRRIGATION-MRGCD		28,314
BERNALILLO RIPARIAN		38,902
TOTAL BERNALILLO	529,716	131,880
TOTAL REGION	694,935	288,844

Figure 7-6 Constituency group preferences (in acre-feet); compares the percentage each value contributes to a total across sectors (Source: The Middle Rio Grande Water Assembly)



	Current Usage	Future Usage (FWUP)	Environmental	Urban Users & Economic	Agricultural / Historical /	Agricultural / Historical /	Specialists - "Minimum Scenario"	Specialists - "Maximum Scenario"
Domestic Uses	57000	118000	57000	82000	84884	40000	69057	69057
Office, Business, Commercial, and Industrial Uses	33000	52000	33000	48000		18250	42197	54101
Irrigated Agriculture Uses	100000	72000	68000	65000	94500	61200	59405	59405
Open Water Uses (Other than EB)	60000	60000	50000	48000	50000	60000	60000	60000
Riparian Uses	135000	135000	145000	130000	126000	112500	107476	107476
Elephant Butte Lake Evaporation	144000	144000	124000	117000	118616	144000	95276	144000

Table 7-4 Specialists' Minimum Scenario (Source: The Middle Rio Grande Water Assembly)

Specialists - "Minimum Scenario"			Desired Year 2050 Use Budget					**Assumptions**
			A		B		C	
Water Line Item			Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Inflows to the Middle Rio Grande Region								
1	Rio Grande Native Inflows		N/A		N/A		1,100,000	
2	Tributary and Ground-water Inflows		N/A		N/A		245,000	
3	San Juan/Chama Inflows		N/A		N/A		74,000	
4	Imports from Socorro/Sierra Region		N/A		N/A		___,000	
5	Imports from Other Sources (must identify the source)						___,000	
6	Urban Storm Drain Inflow		N/A		N/A		5,000	
7	Total Water Income to the Region		N/A		N/A		1,424,000	No changes
Uses of Water within the Region								
8	Elephant Butte Lake Evaporation		11,964 surface acres		7.96 afpy per surface acre		95,276	12,000 acres (25% reduction); Evap/Acre 9 ð 8 (Evaporation rate reduction of ~ 12% from 9 ð 8 based on reduced surface area) (move storage to Wagon Wheel area for reduced evap in new reservoir. Political feasibility based on 55,000 Ac-ft is authorized minimum recreational at E Butte) Parameters reflect impacts at both storage areas.
9	Socorro/Sierra Region Current Delivery Rate		N/A		N/A		100,000	
10	Rio Grande Compact Deliveries		N/A		N/A		850,000	
11	Total Required Deliveries Outside of the Region		N/A		N/A		1,045,276	

Table 7-4 (continued) Specialists' Minimum Scenario (Source: The Middle Rio Grande Water Assembly)

Specialists - "Minimum Scenario"			Desired Year 2050 Use Budget					Assumptions
			A		B		C	
Water Line Item			Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Uses of Water within the Region								
12	Riparian Uses		45,000 riparian acres		2.39 afpy per riparian acre		107,476	Changed ET/Acre from 3 to 2.39 (20% reduction)
13	Open Water Uses (Other than Elephant Butte)		12,000 open water acres		5.0 afpy per open water acre		60,000	River areas = Rio Grande 6900 acres & Jemez 2600 acres. Conversion to closed onduit (main laterals and drains) was judged to be ~10% due to slope constraints, etc. or about 83.4 miles that could be converted.
14	Irrigated Agriculture Uses		33,970 irrigated acres		1.75 afpy per irrigated acre		59,405	34,000 acres (30% reduction) ; ET/Acre 2.1 to 1.75 (7% reduction); Total Use 100,000 to 59,712 ac-ft. (40% reduction in consumptive use). Additional crop changes, etc. could drive this lower.
15	Office, Business, Commercial, and Industrial Uses		551,196 jobs		0.08 afpy per job		42,197	Jobs. 343,000 to 550,000 (152%) (based on FWUP Series B); Per Job use 0.096 to 0.08 (79%); Total Use 33,000 to 42,197 ac-ft. (111%)
16	Domestic Uses		1,150,943 persons		0.06 afpy per person		69,057	Population – 712,000 to 1,150,943 people (161%) (based on FWUP Series B); Per Capita use 0.08 to 0.06 (75%); Total Use 57,000 to 80,362 ac-ft. (128%) Population was increased based on FWUP Series C. Consumptive use projected as 0.08 to 0.06 ac-ft/person.
17	Total Use of Water within the Region		N/A		N/A		338,135	
18	Net (renewable minus consumption)		N/A		N/A		40,589	

Table 7-5 Specialists' Maximum Scenario (Source: The Middle Rio Grande Water Assembly)

Specialists – "Maximum Scenario"			Desired Year 2050 Use Budget					Assumptions
			A		B		C	
Water Line Item			Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Inflows to the Middle Rio Grande Region								
1	Rio Grande Native Inflows		N/A		N/A		1,100,000	
2	Tributary and Ground-water Inflows		N/A		N/A		245,000	
3	San Juan/Chama Inflows		N/A		N/A		74,000	
4	Imports from Socorro/Sierra Region		N/A		N/A		___,000	
5	Imports from Other Sources (must identify the source)						___,000	
6	Urban Storm Drain Inflow		N/A		N/A		5,000	
7	Total Water Income to the Region		N/A		N/A		1,424,000	
Uses of Water within the Region								
8	Elephant Butte Lake Evaporation		11,964 surface acres		7.96 afpy per surface acre		144,000	
9	Socorro/Sierra Region Current Delivery Rate		N/A		N/A		100,000	
10	Rio Grande Compact Deliveries		N/A		N/A		850,000	
11	Total Required Deliveries Outside of the Region		N/A		N/A		1,094,000	

Table 7-5 (continued) Specialists' Maximum Scenario (Source: The Middle Rio Grande Water Assembly)

Specialists – "Maximum Scenario"			Desired Year 2050 Use Budget					Assumptions
			A		B		C	
Water Line Item			Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Uses of Water within the Region								
12	Riparian Uses		45,000 riparian acres		2.39 afpy per riparian acre		107,476	Changed ET/Acre from 3 to 2.39 (20% reduction)
13	Open Water Uses (Other than Elephant Butte)		12,000 open water acres		5.0 afpy per open water acre		60,000	River areas = Rio Grande 6900 acres & Jemez 2600 acres. Conversion to closed onduit (main laterals and drains) was judged to be ~10% due to slope constraints, etc. or about 83.4 miles that could be converted.
14	Irrigated Agriculture Uses		33,970 irrigated acres		1.75 afpy per irrigated acre		59,405	34,000 acres (30% reduction) ; ET/Acre 2.1 to 1.75 (7% reduction); Total Use 100,000 to 59,712 ac-ft. (40% reduction in consumptive use). Additional crop changes, etc. could drive this lower.
15	Office, Business, Commercial, and Industrial Uses		707,000 jobs		0.08 afpy per job		54,101	Jobs. 343,000 to 707,000 (206%) (based on FWUP Series B); Per Job use 0.096 to 0.08 (79%); Total Use 33,000 to 54,101 ac-ft. (164%)
16	Domestic Uses		1,150,943 persons		0.06 afpy per person		69,057	Population – 712,000 to 1,150,943 people (161%) (based on FWUP Series B); Per Capita use 0.08 to 0.06 (75%); Total Use 57,000 to 80,362 ac-ft. (128%) Population was increased based on FWUP Series C. Consumptive use projected as 0.08 to 0.06 ac-ft/person.
17	Total Use of Water within the Region		N/A		N/A		350,039	
18	Net (renewable minus consumption)		N/A		N/A		-20,039	

Table 7-6 AC&HWA Scenario I (Source: The Middle Rio Grande Water Assembly)

Agricultural / Historical / Cultural Advocates - Scenario I Water Line Item			Desired Year 2050 Use Budget A Number of Units		 B Per Unit Use		 C Total Water Use (afpy)	Assumptions
Inflows to the Middle Rio Grande Region								
1	Rio Grande Native Inflows		N/A		N/A		1,100,000	
2	Tributary and Ground-water Inflows		N/A		N/A		245,000	
3	San Juan/Chama Inflows		N/A		N/A		74,000	
4	Imports from Socorro/Sierra Region		N/A		N/A		0	
5	Imports from Other Sources (must identify the source)							
6	Urban Storm Drain Inflow		N/A		N/A		5,000	
7	Total Water Income to the Region		N/A		N/A		1,424,000	Inflows stayed constant
Uses of Water within the Region								
8	Elephant Butte Lake Evaporation		18,249 surface acres		6.5 afpy per surface acre		118,616	Real numbers = 144,000 acft & 6.5 acft per acre evaporation. Reduce the surface area to the legal minimum (12,000 acres), subtract that from the real (22,000) acres, then multiply that by 4 acft evap in the northern part of the state, multiply the 12,000 acres by 6.5.
9	Socorro/Sierra Region Current Delivery Rate		N/A		N/A		100,000	
10	Rio Grande Compact Deliveries		N/A		N/A		850,000	
11	Total Required Deliveries Outside of the Region		N/A		N/A		1,068,616	

Table 7-6 (continued) AC&HWA Scenario I (Source: The Middle Rio Grande Water Assembly)

Agricultural / Historical / Cultural Advocates - Scenario I Water Line Item			Desired Year 2050 Use Budget A Number of Units		 B Per Unit Use		 C Total Water Use (afpy)	Assumptions
Uses of Water within the Region								
12	Riparian Uses		42,000 riparian acres		3.0 afpy per riparian acre		126,000	Some riparian losses due to land use change in areas outside the levees, and some losses from the reduction of ditchbank riparian when conveyances are lined or covered.
13	Open Water Uses (Other than Elephant Butte)		10,000 open water acres		5 afpy per open water acre		50,000	Open water changed from ditch/drain covering and/or eliminating, and from less water in the river meaning less evap losses. (fairly small change)
14	Irrigated Agriculture Uses		45,000 irrigated acres		2.1 afpy per irrigated acre		94,500	Some ag acreage losses, although the trend has slowed in recent years. Also, a significant portion of this land is in tribal hands, and is therefore untouchable. Ag land also includes the giant backyards which are not subject to land use change.
15	Office, Business, Commercial, and Industrial Uses						33,000	The "per job" line was eliminated as this completely ignored home based businesses and all ag related economies, including the ag dependent retail and wholesale. Line 15 and 16 were combined into "urban" uses.
16	Domestic Uses		898,244 persons		0.0945 afpy per person		84,884	The use was reduced to .0945 afpy per person to reflect a per capita water metering of about 160 gallons per day, well over Tucson and El Paso and Santa Fe, but less than Albq. Current 209 gallons per day. This is just conservation that other cities do. Population growth limited by resource, quality of life decisions, and tribal sovereignty.

Table 7-6 (continued) AC&HWA Scenario I (Source: The Middle Rio Grande Water Assembly)

Agricultural / Historical / Cultural Advocates - Scenario I			Desired Year 2050 Use Budget					Assumptions
			A		B		C	
Water Line Item			Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
17	Total Use of Water within the Region		N/A		N/A		355,384	
18	Net (renewable minus consumption)		N/A		N/A		0	

Table 7-7 AC&HWA Scenario II (Source: The Middle Rio Grande Water Assembly)

Agricultural / Historical / Cultural Advocates - Scenario II			Desired Year 2050 Use Budget					Assumptions
			A		B		C	
Water Line Item			Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Inflows to the Middle Rio Grande Region								
1	Rio Grande Native Inflows		N/A		N/A		1,100,000	
2	Tributary and Ground-water Inflows		N/A		N/A		245,000	
3	San Juan/Chama Inflows		N/A		N/A		74,000	
4	Imports from Socorro/Sierra Region		N/A		N/A		0	
5	Imports from Other Sources (must identify the source)							
6	Urban Storm Drain Inflow		N/A		N/A		5,000	
7	Total Water Income to the Region		N/A		N/A		1,424,000	
Uses of Water within the Region								
8	Elephant Butte Lake Evaporation		16,000 surface acres		9.0 afpy per surface acre		144,000	Any solution or reduction is nigh impossible
9	Socorro/Sierra Region Current Delivery Rate		N/A		N/A		100,000	
10	Rio Grande Compact Deliveries		N/A		N/A		850,000	Beneficial changes to Compact deliveries appear to be impossible
11	Total Required Deliveries Outside of the Region		N/A		N/A		1,094,000	

Table 7-7 (continued) AC&HWA Scenario II (Source: The Middle Rio Grande Water Assembly)

Agricultural / Historical / Cultural Advocates - Scenario II			Desired Year 2050 Use Budget					Assumptions
	Water Line Item		A Number of Units	x	B Per Unit Use	=	C Total Water Use (afpy)	
Uses of Water within the Region								
12	Riparian Uses		45,000 riparian acres		2.5 afpy per riparian acre		112,500	Reduced use by .5ac/ft/acre because of exotics removal. 10,000 less acres turned into ag. Maintenance at 2.0ac/ft/acre
13	Open Water Uses (Other than Elephant Butte)		12,000 open water acres		5.0 afpy per open water acre		60,000	Added 10,000 acres of former riparian as maintenance. Extra water from ag. Conservation
14	Irrigated Agriculture Uses		34,000 irrigated acres		1.8 afpy per irrigated acre		61,200	
15	Office, Business, Commercial, and Industrial Uses		250,000 jobs		0.073 afpy per job		18,250	jobs reduced to fit resource availability
16	Domestic Uses		500,000 persons		0.08 afpy per person		40,000	jobs reduced to fit resource availability
17	Total Use of Water within the Region		N/A		N/A		291,950	
18	Net (renewable minus consumption)		N/A		N/A		38,050	

Table 7-8 Environmentalists' Scenario (Source: The Middle Rio Grande Water Assembly)

	Environment Advocates		Desired Year 2050 Use Budget					Assumptions
			A		B		C	
	Water Line Item		Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Inflows to the Middle Rio Grande Region								
1	Rio Grande Native Inflows		N/A		N/A		1,100,000	
2	Tributary and Ground-water Inflows		N/A		N/A		245,000	
3	San Juan/Chama Inflows		N/A		N/A		74,000	
4	Imports from Socorro/Sierra Region		N/A		N/A		0	
5	Imports from Other Sources (must identify the source)						0,000	
6	Urban Storm Drain Inflow		N/A		N/A		8,000	increased urbanization expected to increase runoff
7	Total Water Income to the Region		N/A		N/A		1,427,000	
Uses of Water within the Region								
8	Elephant Butte Lake Evaporation		13,780 surface acres		9 afpy per surface acre		124,000	
9	Socorro/Sierra Region Current Delivery Rate		N/A		N/A		100,000	
10	Rio Grande Compact Deliveries		N/A		N/A		850,000	
11	Total Required Deliveries Outside of the Region		N/A		N/A		1,074,000	

Table 7-8 (continued) Environmentalists' Scenario (Source: The Middle Rio Grande Water Assembly)

	Environment Advocates		Desired Year 2050 Use Budget					Assumptions
			A		B		C	
	Water Line Item		Number of Units	x	Per Unit Use	=	Total Water Use (afpy)	
Uses of Water within the Region								
12	Riparian Uses		56,250 riparian acres		2.4 afpy per riparian acre		135,000 10,000	includes 10,000 afpy for instream flows
13	Open Water Uses (Other than Elephant Butte)		10,000 open water acres		5 afpy per open water acre		50,000	
14	Irrigated Agriculture Uses		34,000 irrigated acres		2 afpy per irrigated acre		68,000	expect a small increase in irrigation efficiency
15	Office, Business, Commercial, and Industrial Uses						33,000	water for new uses must be obtained by conservation
16	Domestic Uses						57,000	water for new uses must be obtained by conservation
17	Total Use of Water within the Region		N/A		N/A		353,000	
18	Net (renewable minus consumption)		N/A		N/A		0	

Table 7--9 Urban Users' Scenario (Source: The Middle Rio Grande Water Assembly)

Urban Users & Economic Development Advocates Water Line Item			Desired Year 2050 Use Budget A Number of Units		 B Per Unit Use		 C Total Water Use (afpy)	Assumptions
Inflows to the Middle Rio Grande Region								
1	Rio Grande Native Inflows		N/A		N/A		1,100,000	
2	Tributary and Ground-water Inflows		N/A		N/A		245,000	
3	San Juan/Chama Inflows		N/A		N/A		74,000	
4	Imports from Socorro/Sierra Region		N/A		N/A		10,000	Water transfer through open market
5	Imports from Other Sources (must identify the source)						0,000	
6	Urban Storm Drain Inflow		N/A		N/A		10,000	Increase urbanization will cause more pavement with more rain water run off
7	Total Water Income to the Region		N/A		N/A		1,439,000	
Uses of Water within the Region								
8	Elephant Butte Lake Evaporation		18,249 surface acres		6.5 afpy per surface acre		117,000	Decrease Elephant Butte's surface size. Possibilities include making lake deeper, moving a portion up north or naturally shrinking size for water conservation.
9	Socorro/Sierra Region Current Delivery Rate		N/A		N/A		90,000	Imported 10,000 above
10	Rio Grande Compact Deliveries		N/A		N/A		850,000	Beneficial changes to Compact deliveries appear to be impossible (UUED Group would like to see if this can be negotiated)
11	Total Required Deliveries Outside of the Region		N/A		N/A		1,057,000	

Table 7-9 (continued) Urban Users' Scenario (Source: The Middle Rio Grande Water Assembly)

Urban Users & Economic Development Advocates Water Line Item			Desired Year 2050 Use Budget A Number of Units		B Per Unit Use		C Total Water Use (afpy)	Assumptions
Uses of Water within the Region								
12	Riparian Uses		42,000 riparian acres		3.0 afpy per riparian acre		130,000	Increase open space within the bosque and decrease non-native plants to decrease consumptive use
13	Open Water Uses (Other than Elephant Butte)		12,000 open water acres		4 afpy per open water acre		48,000	Reduce evaporation in open ditches and lessen conveyance losses
14	Irrigated Agriculture Uses		34,000 irrigated acres		1.9 afpy per irrigated acre		65,000	Kept ag lands to same 2050 amount; increased efficiency (10%) while maintaining shallow aquifer benefits
15	Office, Business, Commercial, and Industrial Uses		707,000 jobs		.0672 afpy per job		48,000	Used BBER predicted jobs and require increase water efficiency by 30 % from today's use.
16	Domestic Uses		1,470,000 persons		.056 afpy per person		82,000	Used FWUP predicted population and require increase water efficiency by 30 % from today's use.
17	Total Use of Water within the Region		N/A		N/A		373,000	
18	Net (renewable minus consumption)		N/A		N/A		9,000	Water Balanced in 2050. UUED Group used a balanced approached requiring more efficiency out of all water users while maintaining a high quality of life.

Table 7-10 Water Balancing Exercise Results by Constituency Group (Source: The Middle Rio Grande Water Assembly)

	Elephant Butte Lake Evaporation			Riparian Uses			Open Water Uses (Non-EB)		
Constituency Group	**Acres**	Afpy / acre	Acre feet	Acres	Afpy / acre	Acre feet	Acres	Afpy / acre	Acre feet
Current Usage	16,000	9	144,000	45,000	3	135,000	12,000	5	60,000
Future Usage (FWUP)	16,000	9	144,000	45,000	3	135,000	12,000	5	60,000
Environmental	13,780	9	124,000	56,250	2.4	145,000	10,000	5	50,000
Urban Users & Economic Development	18,249	6.5	117,000	42,000	3	130,000	12,000	4	48,000
Agricultural / Historical / Cultural Advocates (1)	18,249	6.5	118,616	42,000	3	126,000	10,000	5	50,000
Agricultural / Historical / Cultural Advocates (2)	16,000	9	144,000	45,000	2.5	112,500	12,000	5	60,000
Specialists - "Minimum Scenario"	11,964	7.96	95,276	45,000	2.39	107,476	12,000	5	60,000
Specialists -"Maximum Scenario"	16,000	9	144,000	45,000	2.39	107,476	12,000	5	60,000

Table 7-10 (continued) Water Balancing Exercise Results by Constituency Group (Source: The Middle Rio Grande Water Assembly)

	Irrigated Agriculture Uses			Office, Business, Commercial,and Industrial Uses			Domestic Uses		
Constituency Group	Acres	Afpy / acre	Acre feet	Jobs	Afpy / job	Acre feet	Persons	Afpy / person	**Acre feet**
Current Usage	48,000	2.1	100,000	343,000	0.096	33,000	713,000	0.08	57,000
Future Usage (FWUP)	34,000	2.1	72,000	707,000	0.073	52,000	1,470,000	0.08	118,000
Environmental	34,000	2	68,000			33,000			57,000
Urban Users & Economic Development	34,000	1.9	65,000	707,000	0.0672	48,000	1,470,000	0.056	82,000
Agricultural / Historical / Cultural Advocates (1)	45,000	2.1	94,500				898,244	0.0945	84,884
Agricultural / Historical / Cultural Advocates (2)	34,000	1.8	61,200	250,000	0.073	18,250	500,000	0.08	40,000
Specialists - "Minimum Scenario"	33,970	1.75	59,405	551,196	0.08	42,197	1,150,943	0.06	69,057
Specialists -"Maximum Scenario"	33,970	1.75	59,405	707,000	0.08	54,101	1,150,943	0.06	69,057

Table 7-10 (continued) Water Balancing Exercise Results by Constituency Group (Source: The Middle Rio Grande Water Assembly)

	Total Use	Net (renewable minus consumption)
Constituency Group	Acre feet	Acre feet
Current Usage	385,000	
Future Usage (FWUP)	437,000	
Environmental	353,000	0
Urban Users & Economic Development	373,000	9,000
Agricultural / Historical / Cultural Advocates (1)	355,384	0
Agricultural / Historical / Cultural Advocates (2)	291,950	38,050
Specialists - "Minimum Scenario"	338,135	40,589
Specialists -"Maximum Scenario"	350,039	-20,039

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