Supporting Document K-2

Converged Scenario Development

Colloquy2.doc

Middle Rio Grande Regional Water Plan
Colloquy – Convergence of Scenarios
May 14, 2003, Albuquerque

Ed Moreno, Lilly Irvin-Vitela, Facilitators

Bob Wessely called the meeting to order. The purpose of the meeting was to begin the process of convergence of the various scenarios based on the results of the Community Conversations Series 6. All of the originally-scheduled CCs had occurred, however another had been scheduled for May 20 in Belen due to a conflict on the original date – April 29 – on which a large public meeting on an urgent matter had been scheduled.
Two main topics were outlined for the colloquy: scenario convergence and Rio Grande Compact issues.

Rio Grande Compact Issues
At the request of the facilitator, the attendees first discussed Rio Grande Compact considerations. The central issue, which had been raised in previous meetings of the AC and the Public Participation Committee as well as through exchanges of electronic mail, is the extent to which the MRG Regional Water Plan must ensure that the region does not violate the Rio Grande Compact.
Mike McGovern said that the MRGRWP is the only regional plan that upholds the compact and that it is a state responsibility not that of the region.
Kevin Bean said that various attempts to achieve compliance with the compact by the environmental scenario were not successful and that to be successful it will take severe action on the alternatives.
Participants agreed that the collaborative model is a good tool but that, because of certain data gaps and assumptions (consumptive-use savings was cited), it may not be able to determine whether compact compliance can be achieved under any balanced scenario.
Several participants said the Regional Water Planning Workbook requires that
Interstate Stream Commission would not accept the MRGRWP if it does not result in compliance with the compact, and warned that the state would take over the responsibility of writing the regional plan if the region does not achieve a compliant plan. Others pointed out that the Regional Water Planning Handbook requires that compacts be taken into account.
Participants noted that the MRG Water Assembly had agreed to not take water from other areas in order to balance the supply and demand for the region.

Scenario Convergence
The facilitator proposed a process for converging the primary scenarios, which are focused on agriculture, environment, urban uses, a synthesis of the above, and an alternative view proposed by the Scenario Development Committee Water for the Future.

The process was generally to identify the alternatives – directly or indirectly reflected in the collaborative model and otherwise – that were in agreement among the various scenarios or could be worked quickly to agreement. A second phase would be to identify those alternatives on which there could be an agreement in principle. A third phase would identify the alternatives for which there was no agreement, and hold those separately as unreconcilable at this time.
Working in two groups, the AC Colloquy identified those areas in which all of the scenarios were in agreement or close to actual agreement.
Lee Brown of the Synthesis SDC said the committee had agreed to meet one other time to refine its scenario and would not be prepared to undertake the entire convergence process this evening.

The areas in which agreement was evident among the scenarios are reflected in the following chart:

Convergence worksheet
(Model sliders only)

Categories and Actions	**Synth-WTF Group(Ed)**			**Ag Enviro Group (Lilly)**		
Residential	**Agree**	**Close**	**Not**	**Agree**	**Close**	**Not**
Existing homes convert to low flow						
New homes low flow appliances	X			X 100%		
Existing homes change to xeriscape				X 75%		
New homes xeriscape	X			X 100%		
Reduce size of yards in new homes						X
Reduction in consumption by xeriscape	X			X 50%		
Price elasticity of demand						X
Average price of water						X
Existing acreage convert to rooftop harvesting	X	X		X 25%		
Rooftop harvesting for new construction				X 100%		
Existing population convert to graywater				X 20%		
Onsite graywater for new construction					X 60-75%	

Nonresidential						
Convert existing commercial to low flow				X 75%		
Low flow appliances new construction	X			X 90%		
Convert existing commercial to xeriscaping				X 90%		
Xeriscaping new construction	X			90%		
Reduce landscaping for new commercial		X			X	
City of Albuquerque water reuse plan	X			X		
Reduce acreage of parks and golf courses			X	X		
San Juan Chama						
Use San Juan Chama water				X		
San Juan Chama supply				X		
Bosque						
Bernalillo	X			100%		
Sandoval	X			100%		
Valencia	X			100%		
Categories and Actions	**Agree**	**Close**	**Not**	**Agree**	**Close**	**Not**
Bosque treatment time horizon		X		X 20%		
Agriculture						
Control conveyance						
Length of conveyance line and cover		X				X 0-50 miles
Length of conveyance channel to line			X			X 0-300 miles
Control irrigation efficiency						X
Desired acreage to laser level						X
Desired farm acreage to line pipe delivery canals						X
Desired drip irrigation acreage						X
Control crop acreage						
Alfalfa						X
Corn						X
Sorghum						X
Wheat						X
Oats						X

Fruit						X
Nursery						X
Melons						X
Pasture						X
Peppers						X
Misc. vegetables						X
Total crop area						25,000 - 44,000
Total crop consumption						58,000 - 82,000
Desalination						
Desired quantity of desalinated water		X				X
Water source						
Interest rate						
Year desal water available						
Population						
Bernalillo						
Sandoval						
Valencia						
Self-supplied						
Drought						
Year drought begins				Now		
Years drought will last				25 years		
Drought intensity					5-35%	
Transfers						
Treated Socorro sierra bosque acreage						
Future Socorro sierra crop acreage						
Tine horizon for change						
Cost to retire acre of farm land						
Reservoirs						
Control reauthorization						
Abiquiu shared pool reauthorization						
Abiquiu reauthorization						
Compact renegotiations						
Year renegotiations takes effect						
Minimum reservoir volume						
Control new storage						
New northern reservoir						
Artificial recharge						
Year new reservoir is completed						

Small Group Discussion

Ag – Enviro Group (Lilly)

Residential Conservation Measures

Low-flow appliances for new residences support exists because

- this can be regulated
- responsibility for change is on future residents
- politically feasible
- the cost differential is not significant between traditional and low-flow

Low flow appliances existing homes rationale for support

- subsidies
- will be implemented over time

Xeriscaping rational for support

- xeriscape recognizes we live in a desert
- onus for change is primarily on new homes but is an option with subsidies for existing homes
- xeriscape has a range of options that are aesthetically pleasing
- need to look for turf alternatives that require minimal water and can withstand high traffic for family homes

Rooftop Harvesting

- this is a tool to enable water savings
- this practice creates a water wise ethic
- once the industry figures out how to create harvesting systems in new homes it's a "no brainer"
- retrofitting faces challenges but if its affordable and education occurs the group believes at least 25% of existing homes will opt to harvest water

Greywater

- some soils are more appropriate for using greywater
- there may be a public perception problem
- education is key
- if implemented overtime and anticipated in new homes the costs can be planned for
- Building codes that mandate for new homes will require regulatory oversight
- Different land use choices may make greywater re-use more effective

Urban Water Pricing

- the range among scenarios is too different to agree right now
- as decision is made the WA should consider block pricing and protections for low/fixed income users
- Study indicates that the range of moderate support to complete support outweighs the No vote on water price increases.
- By increasing the cost of water, utilities can use increased revenue to upgrade the infrastructure to increase water efficiency
- group questioned the accuracy of the elasticity measure in the model

Non-residential Conservation measures

- (see analysis for residential)
- Reduced landscaping may have some unintended consequences like asphalt
- Consensus in group is that commercial properties need to have some landscaping that is low water use.
- there should be a reduction in irrigated landscape but not open space

City of Albuquerque

- Public parks should have a higher value than golf courses.
- Maintaining parks will be increasingly important as residential yards are xeriscaped
- There needs to be a reduction in irrigated acreage overall but primary reductions need to come from golf courses by at least 20%.

San Juan Chama

- San Juan Chama has technical implementation problems
- this source of water creates a false sense of security
- Different studies project different amounts of water actually making it to Albuquerque (concern that the model might overstate the actual amount of water coming into the region)

Bosque

- different riparian areas will require varying degrees of intervention
- not all salt cedars and Russian olives will need to be removed to save water and reduce evaporation
- support for bosque management is as much a statement of taking care of land uses we collectively value as a question of how to save water
- one way to manage the areas that are cleared in the bosque is to use low water agricultural crops- (Look at Bosque del Apache)

Agriculture

- over watering happens
- education is key to using water efficiently
- traditional local wisdom has been lost in some places and needs to be regained in order to manage water well
- changes in crop acreage require subsidies and education
- SDCs may be overestimating the impact of laser-leveling because it is happening to a greater extent

Desalination

- The changes demonstrated in the current model are not significant to encourage this alternative. (economy of scale)
- pipelines and costs of energy to operate desalination plants are high and may be prohibitive in the future given the costs of fossil fuels
- Disposal of salt is unresolved
- drilling for salt water can contaminate fresh water and it is currently illegal to drill for brackish water in NM
- desalination may be a short-term alternative
- desalinated water would support survival not allow for present growth rates
- belief expressed that NM will be desalinating water locally within the next 10 years

Population

- Balancing the competing need to use less water with the need for economic vitality and population growth is difficult

Drought

- a 25 year or more drought is not unrealistic
- drought is cumulative
- may be difficult/impossible to regain a greenbelt once it is lost
- If land is taken out of agricultural production during drought, it becomes vulnerable to urban development pressure.
- If drought increases in its severity (long-term history suggests it will) then the cultural, economic, consequences will be severe.
- Drought requires our community to change our lifestyles.
- A combination of good water management practices and a community-driven collective approach are key to surviving drought.
- Drought may result in temptation to pump the aquifer more but subsidence is a reality and the geological/hydrological and economic costs are unknown.
- Education "retooling" is key to water balancing in a long drought

Synthesis-WTF Group (Ed)

- Agriculture diversions changes don't affect the balance much.
- Lining can save water, as the case of San Diego, which paid for the lining of Imperial Valley canals and could claim half of the water saved.
- Crop selection and acreage don't work without some marketing development.

Non-Modeled Alternatives

The attendees participated in a straw vote on the non-modeled alternatives, which generally reflected the preferences that were derived from the public participation at Regional Forum 5. The top number of "dots" were placed by the alternatives:

Watershed Plans (7)
Land Use (6)
Metering Wells (5)
Water Quality (5)
All others received two, one or no dots.

The meeting broke up about 8:30 p.m.

Submitted by Ed Moreno. For changes, corrections or other information, contact 505-466-2006

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Middle Rio Grande Regional Water Plan
Colloquy – Convergence of Scenarios (Continued)
May 21, 2003, Albuquerque

Ed Moreno, Lilly Irvin-Vitela, Facilitators

Bob Wessely called the meeting to order. Various items of non-convergence business were discussed. The purpose of the colloquy section of the meeting was to continue the convergence of the scenarios in preparation for presentation to the public at the June 7 Regional Forum.

Rio Grande Compact Issues

Further discussion was taken on the subject of the Rio Grande Compact, continuing from the May 14 colloquy. The prevailing sentiment was that the MRGRWP must address compact compliance or the Interstate Stream Commission would not accept the plan. Several participants indicated they had been told as much by officials of the ISC recently. Comments were as follows:

- We need to decide within the region or others will decide for us.
- Our obligation is to deliver water to the next planning region, not the entire compact obligation. It's a state obligation.
- We don't recommend renegotiating the compact but have to meet its strict obligations.
- We don't know the range of flows from wet, dry or average years. For wet years it's off-base, we should use "best hydrology available."
- A variety of compact obligations are in the model.
- We need to meet our obligations to southern New Mexico AND Texas.
- The state engineer says we must abide by the compact.
- The plan is undermined if we don't deal with the conflicts about the compact.
- How are we going to judge compliance with the compact? A spreadsheet? The model?

Scenario Convergence

It was recommended that the scenario being developed from the consensus of the SDC scenarios not be called a "preferred" scenario since the turnout has been so low at the Community Conversations and the Action Committee on the convergence discussions. The scenarios have not been given the depth of discussion required for decision-making since they've been based on the "model" discussions only.

An ***agreement in principle*** was reached during the discussion on agriculture as related to the irrigation efficiency and preservation of acreage components of the scenario. All parties agreed that agriculture had value beyond economic value, that there is value to urban and rural residents alike to having a greenbelt as represented by the farms and ranches of the Rio Grande Valley.

Another aspect of the ***agreement in principle*** was that some land loss by agriculture is inevitable over time as individuals sell their rights. And the green will also be lost.

Other alternatives related to the scenario convergence are as follows:

Bosque Management

The Analysis Team met and revised the acreage of bosque in the MRG Region. The bosque area associated with the river itself was adjusted to 17,000 acres. The remaining acreage, 6,000 acres is considered riparian acreage outside the river corridor. The model uses 21,790 acres for bosque measurement.

Agriculture

- The crop selection settings in the model won't change what happens on the ground. It takes markets, infrastructure, and lifestyle changes that can't be dictated.
- Drip irrigation is costly.
- Monoculture is not viable. Farmers already rotate their crops.
- The agriculture SDC did not have the expertise to tell farmers what to do, so crop selection was seen as a proxy to indicate that there could be some efficiency savings. The agriculture SDC considered it a value to keep existing acreage in irrigation. Everyone needs to conserve.
- Inadequacies in the model related to agriculture include:
    - Doesn't recognize that changes occur over a time span.
    - Lands may be lost to agriculture.
    - The model doesn't show the value of saving water through agriculture management.
    - Want to hold acreage constant
    - Agriculture efficiency – it didn't get us the water numbers. It's a wet-water issue.
    - Compare non-agriculture industry to agriculture. Agriculture is a big user.
    - Urban users have return flow.
    - The availability of wet water is an issue.
- When water rights are sold from a plot of land, the land often remains in use when it is subdivided and individual homes are allowed to drill wells, known as "double-dipping."
- Agriculture has value beyond economic values.
- Agriculture diversion permits for acequias have two different kinds of rights: those that can be diverted and those that can be consumed.
- A concern is that urban users are all metered but agriculture is not metered and so is seen as the culprit for water use.
- Water law in California allowed San Diego to claim half of the water saved by eliminating seepage from canals in the Imperial Valley by lining the canals.
- Junior water rights holders would be more likely to get their fair share of water if efficiencies occur.

- Increased efficiency means less recharge into the aquifer.
- If we want a green valley, we can create laws, ordinance etc. That will direct how land use changes.
- How can agriculture be maintained?
  - Economic and market initiatives: farmers' markets, local industry manufacturing tied to agriculture.
  - Urbanization is irreversible. Rural communities within the region are challenging this attitude.
- The Department of the Interior is predicting a "water war" in the Albuquerque area.
- Agriculture is worth preserving, but economic development and efficiency are key to this.
- It's a "dream" and "nostalgia" to think that population will not increase. Immigration will continue.
- What are we empowered to do? Avoidance of waste, instead of "conservation," response to emergency, and short-term and long-term view.
- In the plan, specify in some detail about how to maintain acreage and increase efficiency.
- Where is waste going to be eliminated? Inspect, license and increase the number of ditch-riders, have regulatory measure and hold MRGCD accountable.

Continuation of Convergence

The AC was unable to complete all of the tasks required for convergence, therefore a five- or six-member team is being appointed by the AC leadership to represent constituency groups at a final convergence meeting to be scheduled.

The meeting broke up about 8:30 p.m.

Submitted by Ed Moreno. For changes, corrections or other information, contact 505-466-2006

THE DRAFT CONVERGED SCENARIO

WHAT ARE SCENARIOS?

Scenarios are descriptions of journeys to possible futures, how the future might unfold.. They reflect different assumptions about how current trends will unfold, how critical uncertainties will play out and what new factors will come into play. While scenarios do not predict, they may paint pictures of possible futures and explore the differing outcomes that might result if basic assumptions are changed. They form an appropriate tool in analyzing how driving forces may influence the future and in assessing the associated uncertainties. The role of policy choices in shaping the future is highlighted wherever possible. Using the alternative actions, scenarios can be told in many ways. The two most common methods used in scenario analysis have been descriptive, written narratives (qualitative scenarios) and tables and figures incorporating numerical data, often generated by sophisticated computer models (quantitative scenarios).

THE DRAFT CONVERGED SCENARIO—A SYNOPSIS

Introduction

After many thousands of volunteer and professional hours and the expenditure of substantial funds over the past six years, we have gathered much data, listened to many community opinions, analyzed alternatives, constructed a computer model, built candidate environmental, urban, agricultural, synthesis and ad hoc (Water for the Future) scenarios and met all together or in small groups on countless occasions. This process has brought us to the point of presenting a single draft scenario that provides an initial framework for a regional water plan. While the plan will, the draft scenario does not yet describe the array of incentives that might be assembled to cause the described future to happen.

Individuals from diverse perspectives formed Scenario Development Committees which contemplated, discussed and debated water management alternatives ranging from rooftop water harvesting to desalination. With assistance from a water model developed by Sandia National Laboratories, these Committees each produced a scenario that best reflects their perspective. To move us closer to developing a plan, the Committees then “converged” their scenarios into the single draft scenario presented here.

Of course, this scenario is not perfect. There is not unanimous support among participants for any aspect of the scenario. While there were some differences of opinion on the water saving alternatives, there was a surprising degree of agreement among the participants. We all want to save water so that our limited water resources go as far as possible. More difficult questions arise in trying to formulate agreement on a vision of what we want the region to look like in fifty years in light of the limitation on our water resources. Vision statements were drafted by the advocacy groups – agricultural, environmental, and economic development and urban users. Looking at those vision statements, it is easy to see the broad strokes of what most of us want. We want a healthy and sustainable economy. We want to preserve the traditional lifestyles and agricultural heritage of the middle valley and the green belt that provides. And we want a healthy, living river that supports an abundance of birds and other wildlife.

The devil, as always, is in the details. A healthy and sustainable economy may be a very different thing to a developer and a traditional farmer on an acequia. We may all want to preserve our agricultural green belt, but economic development interests may also be looking to purchase the water that supports that agriculture for municipal and domestic use or for new industries. And while a healthy environment may be a mom and apple pie kind of issue, environmentalists know that if we want to stop the downward spiral of the Rio Grande, we need to allocate more water to the river. Where is that water to come from in a fully appropriated system?

The problem is figuring out how to make our water meet as much of our visions as possible and where our visions are to give. Balancing the water budget so that use does not exceed supply, the compact is met, and the

aquifer is preserved is thus only the first step in taking control of our water future. We also have to figure out what we want our region to look like in the future and then design policies to get us there.

Draft Scenario

There are, however, several broad categories that are less contentious than others. Bosque restoration, for example, comes the closest to having unanimous support. In the residential and non-residential categories there are numerous areas of agreement. There is broad support for increasing xeriscaping, water harvesting, using more graywater and more low flow appliances. The Scenario Development Committees also support Albuquerque's water reuse plan as well as reducing irrigated acreage dedicated to parks and golf courses. Finally, current predictions (not recommendations) indicate that the population will continue to grow at its current pace, approximately doubling in fifty years.

In other categories there is significantly more debate about what is feasible and desirable. The Scenario Development Committees, while continuing to acknowledge areas of disagreement, did settle on various elements to include in this "converged" scenario. For instance, this scenario assumes that the region will use all the San Juan Chama water that it receives, although there is still significant debate about how to predict the actual water deliveries in dry years and about how much water will be available after losses in transit to the region. This scenario includes 65,000 acre-feet as a possibility.

In the transfers category, this scenario includes restoring the bosque and acquiring water rights to agricultural acreage in the Socorro/Sierra region over the next 50 years. Under the reservoirs category, there will be authorization granted to fully utilize the City of Albuquerque shared pool at Abiquiu, but there will not be an Abiquiu reauthorization to increase storage there nor will there be a new northern reservoir constructed. Additionally, the Rio Grande Compact will be renegotiated by 2015 and an artificial recharge project will be complete by 2010.

There are actually two versions of this "converged" scenario, each portraying a different drought forecast. Version one hypothesizes a 25-year drought, with 25-percent reduction in inflows, coming in at 12% below our 2200 year average. Version two hypothesizes that we will remain level with the last 25 years of a wet cycle.

This converged scenario includes the alternative actions that have been incorporated into the Sandia model, as well as some non-modeled alternatives. In deciding what to include in the model, participants in the Water Assembly process determined that these alternative actions were likely to have the greatest potential for helping us manage our water to ensure future supplies. There are other alternative actions, some with only slightly less potential, which have not been included in the model. The non-modeled alternatives are important not only for their potential to save water, but also because they incorporate values other than water savings, such as protection of the habitat of the Rio Grande.

When we run the model with this scenario, it does not provide a sufficient flow of water out of our region to comply with the Rio Grande Compact. Our next task will be to consider how to improve the mix of alternative actions (both modeled and non-modeled) to assure compliance with the Compact and to meet our mission to balance water use with a renewable supply.

WHAT HAPPENS NEXT?

Using the input from the region, there will be a preferred scenario chosen, which in turn will form the backbone of the Regional Water Plan. In September, the draft Plan will be presented to the public in the three county planning area for comment. As documents are drafted, they will be available for review and comment at www.WaterAssembly.org or by contacting MRCOG at 247-1750.

YOUR TURN

We want your ideas!

THE DRAFT CONVERGED SCENARIO, TAKE II

What Are Scenarios?

Scenarios are descriptions of journeys to possible futures, how the future might unfold.. They reflect different assumptions about how current trends will unfold, how critical uncertainties will play out and what new factors will come into play. While scenarios do not predict, they may paint pictures of possible futures and explore the differing outcomes that might result if basic assumptions are changed. They form an appropriate tool in analyzing how driving forces may influence the future and in assessing the associated uncertainties. The role of policy choices in shaping the future is highlighted wherever possible. Using the alternative actions, scenarios can be told in many ways. The two most common methods used in scenario analysis have been descriptive, written narratives (qualitative scenarios) and tables and figures incorporating numerical data, often generated by sophisticated computer models (quantitative scenarios).

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Current situation

We, residents of the Middle Rio Grande, value our water. The 2000 Survey compiled by the UNM Institute for Public Policy underscored that. For the last several years, however, we have been using more water than is being renewed. Due to groundwater mining, the water table has been lowered in some parts of our region by more than 120 feet. Hence, we realize that we have to change our water ways. How can we do that while staying true to the values expressed by the participants in the regional water planning process? How can we plan for future water uses, especially given the great variability in supply? How can we help the resource to stay healthy so that it can support the future?

To attain our mission, we crafted a regional water budget:

The MRG Water Budget
(thousands of acre feet per year)

330K Recent Average Renewable Income to MRG
385K Recent Consumptive Use within Region
55K Net Average Deficit

Current Uses

Source: Middle Rio Grande Water Budget – Averages for 1972-1997, October 1999
All numeric values are approximate, reflecting currently available information in units of acre feet per year.
One acre foot is about 326,000 gallons

… And We're Facing More Stress

480K Predicted Consumptive Use within region to support projected 50 year growth

Currently, we are using approximately 55,000 acre feet more than is being renewed, and have done so for several years. To meet the mission of the Water Plan, and lessen the long-term consequences, this overdraft needs to be curtailed as soon as possible. Any new uses of water will not only have to come from existing uses, but will also have to respect this reduction goal.

We know that we have to live within the constraints imposed by the Rio Grande Compact, and that we have to cease depletion of the aquifer. Potential lawsuits by downstream neighbors, issues of water quality, sharing water with tribal entities when their rights have not been quantified, Endangered Species Act requirements, variability in weather, are more considerations. Population increases will add new users as well.

Acknowledging this, we aim to develop a positive, doable Regional Water Plan which will make a difference to us and those who follow.

The first step is to reduce the current uses. Applying the Alternative Actions we have collected from public input as well as from local governments and experts, and then had analyzed, as well as working with a computer model we developed with Sandia National Labs, we have struggled with balancing the budget. But we haven't quite arrived at the balance yet. Hence we need to take further actions.

In the pages which follow, you will find the scenario which has been worked on to date, as well as some considerations to bear in mind. Today, it is our task to consider input received, attain the mission and goals of the plan, balance the water budget, adhere to the Rio Grande Compact and respect water rights holders. Later, using it, we will make recommendations as to how to attain that and investigate how jurisdictions can help in attaining the scenario.

Draft Converged Scenario Of Management Options

NOTES – throughout this document are NOTES about the various alternatives. References to public ratings are from the "dots" and "cards" in the 5th CCs. References to the non-modeled notes relate to information from the discussions about how to deal with the non-modeled alternatives. Additional CONSIDERATIONS are also included.

The following is a summary of the management strategies employed in the draft converged scenario broken out by the categories, including those found in the model. Graphical results of the model runs are shown in Figures.[1]

In its default mode the model assumes that water uses will follow the same rates and patterns through 2050 as those in effect in the year 1998. In its default mode the model also assumes that population growth will occur through 2050 with no changes to the rates proposed in 2002 by the Bureau of Business and Economic Research at the University of New Mexico. Using these rates the population grows from about 710,000 people in 2000 to about 1.27 million people in 2050. Fig. 1 shows the Rio Grande Compact (RGC) balance and the aquifer depletion results based on the model's default values. These graphs, and those in Figs. 2 and 3, are based on 100 runs of the model with a different "seed" for each. The seed determines which random pattern of surface water inflows and meteorological variables (drawn from historical data) is used in each run of the model. Fig. 1. shows a mean RGC balance deficit in 2050 of about 1 million af, and a mean aquifer depletion of about –2.5 million af.

[1] These graphs show the mean Rio Grande Compact balance and the mean aquifer depletion levels. The bold line in the graphs represents the mean, and the gray area around the means represent model results within the 5th and 95th percentiles. Although the scenario was built using MRG Model Version 3.1, the results were generated in the latest version of the model, Version 3.2.1. This required a very few changes to be made in some slider bar and button selections. It also results in some changes in the model output. The draft converged scenario should be revisited and revised, based upon output from Version 3.2.1. The actual slider bar and switch settings used in this evaluation are shown in Appendix A. The categories, the alternatives that apply to them, and the slider bars or buttons that apply to both are shown in Appendix B.

Drought/Rainfall

There are actually two versions of the draft converged scenario: one without a significant long-term drought, and one with a drought. "No drought" assumes average inflows from 1950-1998. In the "drought" version, the scenario assumes a drought beginning in 2002 and lasting for 25 years, with the intensity reflecting a 25 percent decrease in annual surface water inflows to the region relative to average inflows from 1950-1998.

Keeping all other inputs set to respective defaults, the "no drought" scenario results in a mean Rio Grande Compact balance of about 400,000 acre-feet in 2050, representing a surplus in favor of the planning region (Fig. 2). However, the Compact balance drops into deficit territory around 2002 and reaches a deficit of about -500,000 af before moving to a surplus by about 2030; this period of deficit represents non-compliance with the Compact. The mean aquifer depletion level in 2050 is approximately -400,000 af (Fig. 1). The scenario shows the net present value of the cost of implementing all the management strategies as about $2.3 billion, and the cost per af of water saved as about $1190.

With a drought factored into the scenario, the mean Rio Grande Compact balance in 2050 reaches a surplus of about 250,000 af in 2050 (Fig. 3), representing a surplus for the region. However, the drought creates a period from about 2002 through about 2040 in which the balance reaches a deficit of about –1 million af; this deficit represents non-compliance with the Compact. In the drought scenario the mean aquifer depletion level in 2050 is about –400,000 af, as in the scenario with no drought. In the drought scenario the net present value of implementing the management strategies and the cost of the water saved per acre foot remain roughly the same as in the no drought scenario.

> Considerations: *Non-compliance with the Compact for 28 years is not acceptable. Is the dip in RG Compact balance due to factors such as (a) typical fifteen year delays in implementing our actions or (b) Ag (MRGCD) continuing at substantially unchanged consumption rates when CABQ slows its pumping of the aquifer in 2006?*

Population

The scenario assumes that population growth will occur over the 50-year planning horizon with no changes to the rates proposed by the Bureau of Business and Economic Research at the University of New Mexico. Using these rates the population grows from about 710,000 people in 2000 to about 1.27 million people in 2050.

> Consideration: *BBER's projections are based upon the assumption that historical trends will continue. What factors might or might not change this assumption? The Goals of the Regional Water Plan call to "balance growth with renewable supply." If this were to apply to population growth, how might this be included in the scenario?*

Residential/Non-Residential

For most of the changes identified in this broad category, the implementation period is 15 years. For all of these various measures, pricing mechanisms will be adjusted to “fit” any specific approach or policy. The scenario features rigorous conservation efforts by installing low flow appliances (e.g. showerheads, sinks, toilets, and clothes washing machines) in 80 percent of existing properties, with low-flow appliances installed in all new properties.

The scenario calls for converting 30 percent of existing landscaping to xeriscape and requiring xeriscaping for all new construction. This scenario also assumes that 25 percent of existing homes will collect water

through rooftop rain harvesting, and that all new homes will have rooftop rain harvesting systems. Additionally, 5 percent of existing homes will convert to on-site gray water re-use, and gray water re-use will be standard in all new homes. There will be a 5 percent reduction in landscaped acreage in commercial properties and an 80 percent reduction in the future growth rate of parks and golf courses.

The scenario also states that all uses of water in the MRG should be measured, and new uses should not impair existing water users. Although controversial, this scenario calls for metering all water supply wells, including domestic wells and all surface water flows through irrigation systems, throughout the water-planning region. **[NOTE A-7, irrigation flow meters not addressed in non-modeled notes and A-8, meter all wells, received low public rating and split rating in non-modeled notes]**

Additionally, governments in the region will develop, adopt and implement a sustainable and coordinated regional growth management plan designed to:

- § reduce water consumption;
- § minimize impact on water resources;
- § encourage conservation -oriented economic development;
- § ensure adequate water supplies for any proposed development, and
- § consider the carrying capacity and location of development. **[A-18, A-21, A-22 , A-56]**

Considerations: *IPP Survey and CC input calls for maintaining or increasing open space for current residents. If population increases along with density, there may be pressure for additional open spaces. What would the effect of more rigorous conservation be?*

How many new homes are included?

Albuquerque Drinking Water Project and San Juan/Chama Diversion

In modeling the converged scenario, the team assumed that the Albuquerque project will come on line as planned in 2006. At the July 15 retreat of the Water Resources Board and the Water Assembly, it was agreed that the San Juan Chama water allotment that will be used in the projected scenario is the amount currently contracted to users within the Middle Rio Grande. **[NOTE need to harmonize model data with WRB/AC comments]**

Considerations*: In 2001, the actual yield of the project was 6,600 af, rather than 96,000. What if the available amount were substantially less than the full allocation? The City has 48,200 af of project water and assumes 47,000 af will reach Albuquerque, while the State Engineer thinks there will be greater transit losses and only approximately 43,000 af will arrive.*

Management/Planning

The scenario includes requirements for several planning initiatives and management requirements that will need to be created and implemented at various management levels from local through federal. The various initiatives include:

§ Identify, quantify, and adjudicate all water rights and all wet water quantities in the water planning region. **[A-71]**

§ Address groundwater/surface water interactions in the statutes for administering water rights (conjunctive management). **[NOTE A-144, conjunctive management, not addressed in non-modeled notes]**

§ Establish a state-based severance tax for water projects planning, and conservation. **[NOTE A-59, severance tax, not addressed in non-modeled notes]** (Many farmers have commented negatively about this tax).

§ Establish more equitable accounting for evaporative losses in the Rio Grande Compact water. **[NOTE A-51, evap loss accounting, rated low importance in non-modeled notes]**

§ Encourage active water resource management by the OSE/ISC, including San Juan / Chama project waters. **[A-143]**

§ 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. **[A-73]**

§ Implement local and regional watershed management plans through all land and water agencies in the area to increase water yield, to prevent erosion, to protect and improve forest health and to protect recharge zones. **[A-66]**

§ Adopt policies to integrate land use and transportation planning and water resource management in all government jurisdictions in the Middle Rio Grande water planning region. **[A-52]**

§ 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. **[A-33]**

§ Enhance and expand local government storm water management 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. **[A-34]**

§ 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. **[A-53]**

§ Establish region-wide educational programs, including public and private school curricula, to encourage voluntary conservation of water. **[A-56]**

Agriculture

The scenario includes lining 150 of the 750 miles of MRGCD irrigation conveyances. It also includes laser leveling all fields, lining 7,500 acres of on-farm irrigation canals, and developing drip irrigation on 2,500 of the 44,000 acres under cultivation. [**A-10, A-7, A-9**]

Neither total crop acreage nor crop type distribution is altered in the scenario. **[A-11]** With no policy changes there is likely to be a 25-30% reduction in irrigated acreage by 2050.

The scenario would permit emergency leasing to meet Compact obligations and environmental needs and would develop protective mechanisms for agricultural properties to support the values of agricultural land which include:

§ health of ecosystem
§ recharge, future potential in terms of compact deliveries, food security and economics
§ airshed and viewshed, wildlife, and cultural/historical values.

Considerations*: Increase in agricultural acreage numbers will change the present mosaic.*

*If remove Pueblo lands from any reduction, then same would be more severe for the remaining private property owners (eg, 48k acres * 25% = 36k, but 48k - 15 k = 33 k * 25% = 24,750 acres) Agriculture, parks and open spaces have rated consistently high in surveys and Community Conversations.*

Water banking

As part of this scenario, water banking would be implemented within the Region to maximize beneficial use and to permit the water right to stay with the owner while the water is leased for a period of time. **[NOTE A-67, water banking, received low public rating as well as a low political feasibility rating.]**

Water Quality

Ensuring access to safe drinking water is a high priority in the scenario. [**A-47, A-26, A-50**] The following actions are designed to address water quality:

§ Identify, protect and monitor areas vulnerable to contamination and restrict groundwater supply wells in sensitive areas.

§ Enforce wellhead protection programs on all public water supply wells within local government jurisdictions.

Bosque/Other Habitat

Another high priority is ensuring river and bosque health. The scenario includes removal of exotic vegetation from all 17,000 acres of bosque within the levees and replanting with native plants. **[A-1]**

As part of this category, the scenario calls for continued studies on evapotranspiration to apply findings to vegetation management programs and encourages the region to develop the economic potential of non-native species removal, harvesting, and output of products by local industries. . **[NOTE A-40, vegetation management, rated low importance in non-modeled notes, and A-2, econ for non-natives, not addressed in non-modeled notes]**

Additionally, this scenario calls for creating constructed wetlands for groundwater recharge, water harvesting, habitat improvement, and hydrological management of the Rio Grande. (Wetlands may be best for post water-treatment plant to bring up water quality.) **[A-36]**

To further develop and support the river and its riparian environment, the scenario includes in-stream flow as a beneficial use. **[NOTE, A-63, instream flow, received split votes in non-modeled notes]**

Consideration*: This may require a determination as to whether state water law includes in-stream flow as a beneficial use (it already has been so deemed in an Attorney General's Opinion and the state has approved of in-stream uses by allowing water to be used for the silvery minnow).*

Reservoirs

The scenario assumes that the Abiquiu Shared Pool Authorization will be enacted. This will allow the MRG Planning Region to store water in whatever might be the unused portion of the City of Albuquerque's storage space in Abiquiu Reservoir. Such storage could be a lower-evaporation alternative to storage in Elephant Butte, and it could provide storage space for an environmental conservation pool. The scenario calls for initiating artificial recharge capabilities in the region starting in 2010.

It also calls for efforts to maximize upstream storage, and in so doing maintain the pool at Elephant Butte Reservoir as close to but no lower than 400,000 af. The scenario supports the idea that the Region should seek to store as much water upstream as possible to the extent that it may be approved by regulatory authorities. This would require Congressional authorization. **[A-45, A-38]**

Desalination/Other Technology

The scenario includes several technological approaches to assist in meeting water management requirements. The scenario calls for research on water supply enhancement techniques, such as weather modification, as well as for moving ahead with desalinating water. Specifically, the scenario projects desalinating and piping 22,500 af/y of water from the Tularosa Basin in southern NM to the MRG basin, starting in 2010. **[NOTE: both A-42, weather modification, and A-39, desalination, received very low public rating]**

Transfers from Socorro and Sierra Counties

Under the draft converged scenario, exotic phreatophyte species will be removed from all 17,500 bosque acres in Socorro and Sierra counties and will be revegetated with native species. It also assumes that surface water rights will be bought from the agricultural users at a cost of $20,000 per acre, reducing agricultural acreage from about 17,500 acres to 12,500 acres. **[NOTE A-69, acquire more rights, received very low public rating]**

> Considerations*: The Regional Water Planning Handbook contains certain Required Assumptions:*
>
> *All planning shall be done within the following parameters. Exceptions to this are possible, but if an exception is to be made, regional water planners must set forth facts and justifications sufficient to indicate that conditions exist within the region to consider such an exception.*
>
> *3.Plans shall presume all future water needs must be met by management of the water supply currently available to the region. If that is not feasible, as supported by analysis in the planning report, other sources of supply may be proposed if feasible in economic and engineering analysis.*
>
> *4.Water conservation should be the first item considered among feasible water supply alternatives in the management of water to meet current and future water demands. Regional water plans should demonstrate what portion of the future water demand could be met from projections of conserved water. Regional water plans should outline the responsibilities and authorities of each local governing body.*

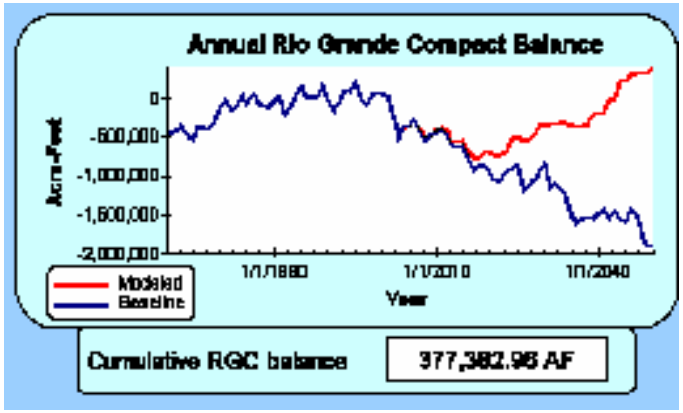
June 7, 2003 draft

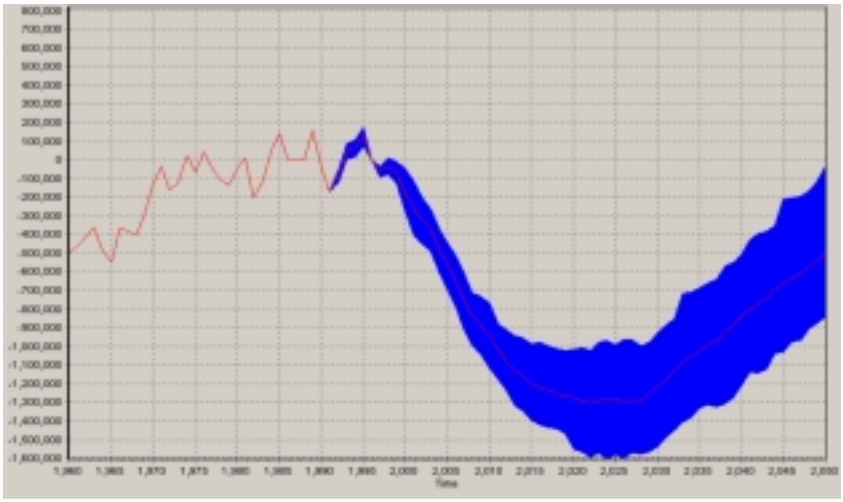
MODELED RESULTS OF DRAFT CONVERGED SCENARIO

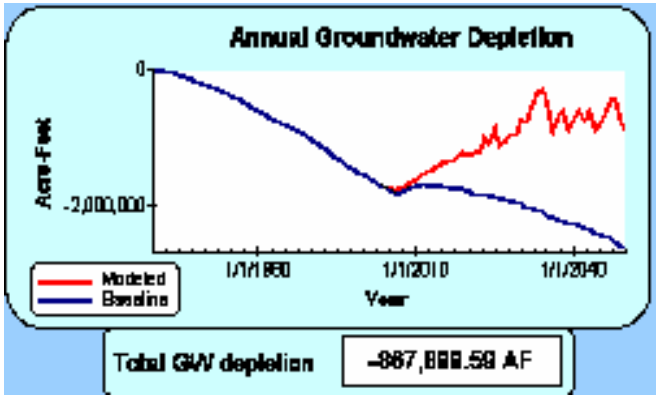
These graphs show cumulative results for the model. The darker line shows the baseline and the other the changes when the scenario is run. These cumulative effects are plotted agains the baseline condition that assumes no changes to current water practices

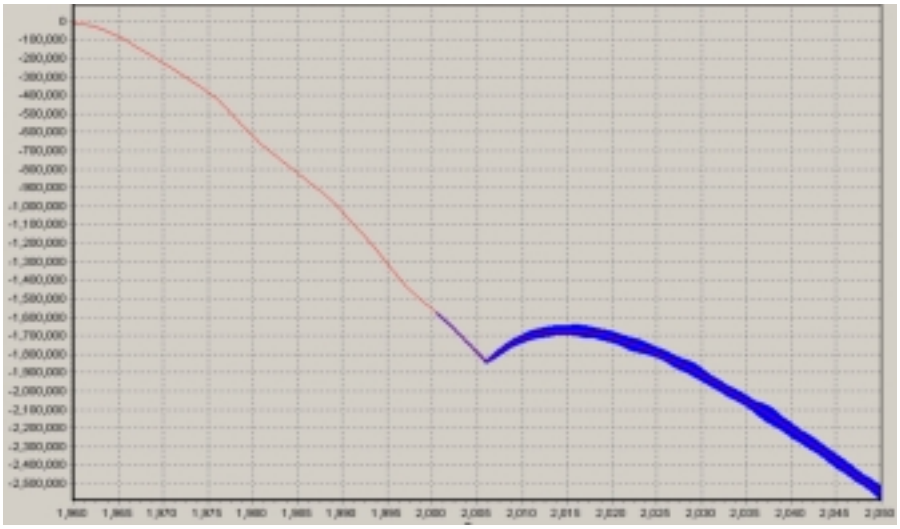
Note that the scale is different between the Rio Grande Compact Balance and the Annual Groundwater Depletion chart. The range in the charts on the right hand side indicate that there is a potential range in future water supply due to variations in climate.

Version one hypothesizes a 25-year drought, with 25-percent reduction in inflows, coming in at 12% below our 2200 year average.









Version two hypothesizes that we will remain level with the last 25 years of a wet cycle.