

Supporting Document I

Information from the Water Balancing Exercise

WATER BALANCING EXERCISE



Total Water Inflows (30 year averages 1972-1997) acre-feet

Native Rio Grande (NRG)	1,100,000
Tributary and Groundwater (T&GW)	245,000
San Juan/Chama (SJ/C)	74,000
Imports from Socorro/Sierra Region (S&S)	0
Imports from Other Sources (OI)	0
Urban Storm Drain (US)	5,000
Total Inflows	1,424,000

Rio Grande Compact Deliveries (RGC)

Some Explanation:

- Established in 1930s
- Divides available water among CO, NM, TX
- Enforced by U.S. Supreme Court
- NM-ISC responsible to ensure NM deliveries

Some Considerations:

- NM obligation depends on inflow at Otowi
- Delivery is measured at EB dam
- Storage requirement at EB is also specified
- Mechanism exists for short term credits/deficits

The Budgeting:	25-Year Average	2020 Projection	2050 Projection
25-Year Average	850,000	850,000	850,000

Elephant Butte Reservoir Evaporation (EB)

Some Explanation:

Under the RG Compact, water is stored at EB Reservoir for delivery downstream. Evaporation from the reservoir's surface is charged to the Middle Rio Grande Region.

Some Considerations:

- EB Reservoir is heavily used for recreation.
- Location is low altitude, hot, and dry, with high evaporation rates.
- Water storage at EB is required under RG Compact.

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
Surface Acres	16,000	16,000	16,000	16,000	100%
Evaporation/Acre	9	9	9	9	100%
Total Use	144,000	144,000	144,000	144,000	100%

Riparian Evapotranspiration (RIP)

Some Explanation:

Riparian evapotranspiration is consumption of water by plants in and along rivers and streams. It includes evaporation and transpiration of water through plants. It includes the bosque as well as growth along streams and ditchbanks.

Some Considerations:

- Plant species consume various amounts of water.
- Some endangered species need riparian habitat.
- Riparian use continues during droughts
- Removing high-water-use plants can reduce consumption.

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
Surface Acres	45,000	45,000	45,000	45,000	100%
ET/Acre	3	3	3	3	100%
Total Use	135,000	135,000	135,000	135,000	100%

Agricultural Evapotranspiration (Ag)

Some Explanation:

Water consumed in irrigated agriculture is that which evaporates from fields, transpires from plants, and which is contained in plants.

Some Considerations:

- Agriculture maintains rural landscapes.
- Agriculture way of life is historic, aesthetic and valued.
- Local food production and consumption has advantages.
- Difficult to restore agriculture after conversion to urban.

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
Surface Acres	48,000	42,400	34,000	48,000	100%
Evaporation / Acre	2.1	2.1	2.1	2.1	100%
Total Use	100,000	89,000	72,000	100,800	100%

Deliveries to Socorro & Sierra Counties

Some Explanation:

There is no formal water delivery agreement between the S&S and MRG regions. Current values are traditional average deliveries from MRG to S&S for consumption in S&S.

Some Considerations:

- MRG could reduce deliveries to S&S via purchase, lease, or other mechanisms.
- S&S is developing its own regional water plan.
- S&S also projects regional growth in demand.

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
S&S Delivery	100,000	100,000	100,000	100,000	100%

Open Water Evaporation (OW)

Some Explanation:

Open water includes rivers, streams, lakes, wetlands, ditches and pools. Because of its size, Elephant Butte is considered separately.

Some considerations:

- Open water provides recreation & habitat for endangered species
- Some open water can be replaced with pipes but conversion costs are high

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
Surface Acres	12,000	12,000	12,000	12,000	100%
Evaporation / Acre	5	5	5	5	100%
Total Use	60,000	60,000	60,000	60,000	100%

Residential Uses (Res)

Some Explanation:

Residential consumption includes evapotranspiration from outdoor plants and trees, and indoor human uses.

Some Considerations:

- Use is linked to population.
- Use is affected by population behavior.
- At current rates, population in MRG will double by 2050.

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
Population	713,000	1,016,000	1,470,000	713,000	100%
Per Capita Use	0.08	0.08	0.08	0.08	100%
Total Use	57,000	81,000	118,000	57,000	100%

Note: "Per Capita Use" reflects residential use on a regional basis.

Business & Government (B&G)

Some Explanation:

B&G covers consumption from commercial, industrial, municipal, state and federal activities, including commercial and industrial production, human consumption, lawns and parks.

Some Considerations:

- Jobs are needed for a healthy economy.
- Some endeavors produce more jobs.
- Some endeavors use more water.

The Budgeting:	25-Year Average	2020 Projection	2050 Projection	Your Budget	% of Average
Jobs	343,000	489,000	707,000	343,000	100%
Consumption/job	0.096	0.087	0.073	0.1	100%
Total Use	33,000	43,000	52,000	32,928	100%

Note: "Consumption/job" reflects business & gov. use on a regional basis

SUMMARY

	Units	Units, % of 25-year average	Per Unit Use	Per Unit Use, % of 25-year average	Sub-total	Sub-total, % of 25-year average
Rio Grande Compact Deliveries (RGC)					850,000	
Elephant Butte Reservoir Evaporation (EB)	16,000	100%	9	100%	144,000	100%
Riparian evapotranspiration (RIP)	45,000	100%	3	100%	135,000	100%
Agricultural Evapotranspiration (Ag)	48,000	100%	2.1	100%	100,000	100%
Deliveries to Socorro & Sierra Counties (S&S)					100,000	100%
Open Water Evaporation (OW)	12,000	100%	5	100%	60,000	100%
Residential Uses (Res)	713,000	100%	0.08	100%	57,000	100%
Business & Government (B&G)	343,000	100%	0.1	100%	33,000	100%
Total Water Use					1,479,000	

Summary of information

acre-feet

Total Water Uses (25 year averages)

acre-feet

Renewable Water Supply	1,424,000
Total Water Uses	<u>-1,479,000</u>
Water Balance	-55,000

Water Budget Uses	529,000
Deliveries to Socorro & Sierra	100,000
Rio Grande Compact Deliveries	<u>850,000</u>
Total Water Uses	1,479,000

The demands on our water resources exceed the renewable supply. We are now trying to determine how to share this critical resource. We need broad public decision-making to achieve this goal.

Summary of Conclusions

Middle Rio Grande Water Supply Study

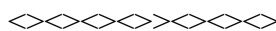
S.S. Papadopoulos & Associates, Inc., August 4, 2000

<http://www.sspa.com/ashu/rio/report/ExecutiveSummary.pdf>

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 variable*, 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 required* 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 groundwater 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 groundwater 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 use*; 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.



For further information regarding regional water planning, please contact Bob Wessely, Water Assembly Chair, (505) 867-3889 <wessely@sciso.com>, or Bob Prendergast, Water Assembly Vice Chair, (505) 857-9225 <rnptep@swcp.com>, or Mike Trujillo, MRGCOG, (505) 247-1750 <MTrujillo@mrgcog.org>.

Water Balancing Worksheet - Quantifying Wet Water Income and Expenses													
Middle Rio Grande Region (Sandoval, Bernalillo, and Valencia Counties)													
Average Consumptive Uses of Wet Water													
		Current Use Budget				No-Action Year 2050 Use Budget				Desired Year 2050 Use Budget			
Water Line Item	Assumptions about Future Use for the Water Line Item	A	B	C	D	E	F	G	H	I	J	Rationale for "Desired" Entries (or reference to attached rationale)	
		Number of Units	X Per Unit Use =	Total Water Use (afpy)	Number of Units	X Per Unit Use =	Total Water Use (afpy)	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	N/A	N/A	1,100,000	N/A	N/A	1,100,000			Assume inflow from the upstream region (SF) will not be reduced.
2	Tributary and Groundwater Inflows	N/A	N/A	245,000	N/A	N/A	245,000	N/A	N/A	245,000			Assume no reduction of deliveries from groundwater and upstream sources.
3	San Juan/Chama Inflows	N/A	N/A	74,000	N/A	N/A	74,000	N/A	N/A	74,000			Assume purchasers will draw their full allocations from the SJ River.
4	Imports from Socorro/Sierra Region	N/A	N/A	0	N/A	N/A	0	N/A	N/A	0			
5	Imports from Other Sources (must identify the source)							N/A	N/A				
6	Urban Storm Drain Inflow	N/A	N/A	5,000	N/A	N/A	5,000	N/A	N/A				
7	Total Water Income to the Region	N/A	N/A	1,424,000	N/A	N/A	1,424,000	N/A	N/A				
Required Deliveries to Outside of the Region													
8	Elephant Butte Lake Evaporation	16,000 surface acres	9.0 afpy per surface acre	144,000	16,000 surface acres	9.0 afpy per surface acre	144,000	surface acres	afpy per surface acre				
9	Socorro/Sierra Region Current Delivery Rate	N/A	N/A	100,000	N/A	N/A	100,000	N/A	N/A	100,000			If less is to be sent to S/S, it should be listed as an "Import" from S/S.
10	Rio Grande Compact Deliveries	N/A	N/A	850,000	N/A	N/A	850,000	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	N/A	N/A	1,094,000	N/A	N/A				
Uses of Water within the Region													
12	Riparian Uses	45,000 riparian acres	3.0 afpy per riparian acre	135,000	45,000 riparian acres	3.0 afpy per riparian acre	135,000	riparian acres	afpy per riparian acre				
13	Open Water Uses (Other than Elephant Butte)	12,000 open water acres	5.0 afpy per open water acre	60,000	12,000 open water acres	5.0 afpy per open water acre	60,000	open water acres	afpy per open water acre				
14	Irrigated Agriculture Uses	48,000 irrigated acres	2.1 afpy per irrigated acre	100,000	34,000 irrigated acres	2.1 afpy per irrigated acre	72,000	irrigated acres	afpy per irrigated acre				
15	Office, Business, Commercial, and Industrial Uses	343,000 jobs	0.096 afpy per job	33,000	707,000 jobs	0.073 afpy per job	52,000	jobs	afpy per job				
16	Domestic Uses	713,000 persons	0.08 afpy per person	57,000	1,470,000 persons	0.08 afpy per person	118,000	persons	afpy per person				
17	Total Use of Water within the Region	N/A	N/A	385,000	N/A	N/A	437,000	N/A	N/A				
Budget Reconciliation: Inflows minus Required Deliveries minus Use within Region													
18	Net	N/A	N/A	-55,000	N/A	N/A	-107,000	N/A	N/A	0,000			Assume successful mission of balancing water use with renewable supply.
Numeric values have been rounded to whole thousands or to two significant figures; afpy = acre feet per year													
Blue numbers are based upon the Water Budget document (+19K S/J/C).													
Green numbers are based upon the Future Water Use Projection Report.													
Brown numbers are based upon USGS reports.													
Black numbers are based upon UNM/BBER data.													
Red numbers are calculated from other numbers on this sheet.													
Violet numbers have been chosen to be equal to their current (year 2000) values.													

Current Use Budget & No-Action Year 2050 Use Budget

	Water Line Item	Current Use Budget			No-Action Year 2050 Use Budget			Assumptions	
		A	B	C	D	E	F		
		Number of Units	X	Per Unit Use = Total Water Use (afpy)	Number of Units	X	Per Unit Use = Total Water Use (afpy)		
<i>Inflows to the Middle Rio Grande Region</i>									
1	Rio Grande Native Inflows	N/A		N/A	1,100,000	N/A	N/A	1,100,000	Assume inflow from the upstream region (SF) will not be reduced
2	Tributary and Groundwater Inflows	N/A		N/A	245,000	N/A	N/A	245,000	Assume no reduction of deliveries from groundwater and upstream sources
3	San Juan/Chama Inflows	N/A		N/A	74,000	N/A	N/A	74,000	Assume purchasers will draw their full allocations from the SJ River
4	Imports from Socorro/Sierra Region	N/A		N/A	0	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	N/A	N/A	5,000	
7	<i>Total Water Income to the Region</i>	N/A		N/A	1,424,000	N/A	N/A	1,424,000	
<i>Required Deliveries to Outside of the Region</i>									
8	Elephant Butte Lake Evaporation	16,000 surface acres		9.0 afpy per surface acre	144,000	16,000 surface acres		9.0 afpy per surface acre	144,000
9	Socorro/Sierra Region Current Delivery Rate	N/A		N/A	100,000	N/A	N/A	100,000	If less is to be sent to S/S, it should be listed as an "Import" from S/S
10	Rio Grande Compact Deliveries	N/A		N/A	850,000	N/A	N/A	850,000	Beneficial changes to Compact deliveries appear to be impossible
11	<i>Total Required Deliveries Outside of the Region</i>	N/A		N/A	1,094,000	N/A	N/A	1,094,000	
<i>Uses of Water within the Region</i>									
12	Riparian Uses	45,000 riparian acres		3.0 afpy per riparian acre	135,000	45,000 riparian acres		3.00 afpy per riparian acre	135,000
13	Open Water Uses (Other than Elephant Butte)	12,000 open water acres		5.0 afpy per open water acre	60,000	12,000 open water acres		5.0 afpy per open water acre	60,000
14	Irrigated Agriculture Uses	48,000 irrigated acres		2.1 afpy per irrigated acre	100,000	34,000 irrigated acres		2.1 afpy per irrigated acre	72,000
15	Office, Business, Commercial, and Industrial Uses	343,000 jobs		0.096 afpy per job	33,000	707,000 jobs		0.073 afpy per job	52,000
16	Domestic Uses	713,000 persons		0.08 afpy per person	57,000	1,470,000 persons		0.08 afpy per person	118,000
17	<i>Total Use of Water within the Region</i>	N/A		N/A	385,000	N/A	N/A	437,000	
<i>Budget Reconciliation: Inflows minus Required Deliveries minus Use within Region</i>									
18	Net	N/A		N/A	-55,000	N/A	N/A	-107,000	Assume successful mission of balancing water use with renewable supply

Numeric values have been rounded to whole thousands or to two significant figures; afpy = acre feet per year

Blue numbers are based upon the Water Budget document (+19K SJ/C).

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Red numbers are calculated from other numbers on this sheet

Violet numbers have been chosen to be equal to their current (year 2000) values.

Brown numbers are based upon USGS reports

Black numbers are based upon UNM/BBER data

Summary

		Environmental			Urban Users & Economic Development			Agricultural / Historical / Cultural Advocates						Specialists					
		Desired Year 2050 Use Budget			Desired Year 2050 Use Budget			Desired 2050 Use Budget - Scenario 1			Desired 2050 Use Budget - Scenario 2			"Minimum Scenario"			"Maximum Scenario"		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Water Line Item	Number of Units X	Per Unit Use	= Total Water Use (afpy)	Number of Units X	Per Unit Use	= Total Water Use (afpy)	Number of Units X	Per Unit Use	= Total Water Use (afpy)	Number of Units X	Per Unit Use	= Total Water Use (afpy)	Number of Units X	Per Unit Use	= Total Water Use (afpy)	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	N/A	N/A	1,100,000	N/A	N/A	1,100,000	N/A	N/A	1,100,000	N/A	N/A	1,100,000	N/A	N/A	1,100,000
2	Tributary and Groundwater Inflows	N/A	N/A	245,000	N/A	N/A	245,000	N/A	N/A	245,000	N/A	N/A	245,000	N/A	N/A	245,000	N/A	N/A	245,000
3	San Juan/Chama Inflows	N/A	N/A	74,000	N/A	N/A	74,000	N/A	N/A	74,000	N/A	N/A	74,000	N/A	N/A	74,000	N/A	N/A	74,000
4	Imports from Socorro/Sierra Region	N/A	N/A	0	N/A	N/A	10,000	N/A	N/A	0	N/A	N/A	0	N/A	N/A	___,000	N/A	N/A	___,000
5	Imports from Other Sources (must identify the source)			0,000			0,000							N/A	N/A	___,000	N/A	N/A	___,000
6	Urban Storm Drain Inflow	N/A	N/A	8,000	N/A	N/A	10,000	N/A	N/A	5,000	N/A	N/A	5,000	N/A	N/A	5,000	N/A	N/A	5,000
7	Total Water Income to the Region	N/A	N/A	1,427,000	N/A	N/A	1,439,000	N/A	N/A	1,424,000	N/A	N/A	1,424,000	N/A	N/A	1,424,000	N/A	N/A	1,424,000
Uses of Water within the Region																			
8	Elephant Butte Lake Evaporation	13,780 surface acres	9 afpy per surface acre	124,000	18,249 surface acres	6.5 afpy per surface acre	117,000	18,249 surface acres	6.5 afpy per surface acre	118,616	16,000 surface acres	9.0 afpy per surface acre	144,000	11,964 surface acres	7.96 afpy per surface acre	95,276	16,000 surface acres	9.0 afpy per surface acre	144,000
9	Socorro/Sierra Region Current Delivery Rate	N/A	N/A	100,000	N/A	N/A	90,000	N/A	N/A	100,000	N/A	N/A	100,000	N/A	N/A	100,000	N/A	N/A	100,000
10	Rio Grande Compact Deliveries	N/A	N/A	850,000	N/A	N/A	850,000	N/A	N/A	850,000	N/A	N/A	850,000	N/A	N/A	850,000	N/A	N/A	850,000
11	Total Required Deliveries Outside of the Region	N/A	N/A	1,074,000	N/A	N/A	1,057,000	N/A	N/A	1,068,616	N/A	N/A	1,094,000	N/A	N/A	1,045,276	N/A	N/A	1,094,000
Uses of Water within the Region																			
12	Riparian Uses	56,250 riparian acres	2.4 afpy per riparian acre	135,000	42,000 riparian acres	3.0 afpy per riparian acre	#####	42,000 riparian acres	3.0 afpy per riparian acre	126,000	45,000 riparian acres	2.5 afpy per riparian acre	112,500	45,000 riparian acres	2.39 afpy per riparian acre	107,476	45,000 riparian acres	2.39 afpy per riparian acre	107,476
13	Open Water Uses (Other than Elephant Butte)	10,000 open water acres	5 afpy per open water acre	#####	12,000 open water acres	4 afpy per open water acre	#####	10,000 open water acres	5 afpy per open water acre	50,000	12,000 open water acres	5.0 afpy per open water acre	60,000	12,000 open water acres	5.0 afpy per open water acre	60,000	12,000 open water acres	5.0 afpy per open water acre	60,000
14	Irrigated Agriculture Uses	34,000 irrigated acres	2 afpy per irrigated acre	#####	34,000 irrigated acres	1.9 afpy per irrigated acre	#####	45,000 irrigated acres	2.1 afpy per irrigated acre	94,500	34,000 irrigated acres	1.8 afpy per irrigated acre	61,200	33,970 irrigated acres	1.75 afpy per irrigated acre	59,405	33,970 irrigated acres	1.75 afpy per irrigated acre	59,405
15	Office, Business, Commercial, and Industrial Uses			#####	707,000 jobs	.0672 afpy per job	#####				250,000 jobs	0.073 afpy per job	18,250	551,196 jobs	0.08 afpy per job	42,197	707,000 jobs	0.08 afpy per job	54,101
16	Domestic Uses			#####	1,470,000 persons	.056 afpy per person	#####	898,244 persons	0.0945 afpy per person	84,884	500,000 persons	0.08 afpy per person	40,000	1,150,943 persons	0.06 afpy per person	69,057	1,150,943 persons	0.06 afpy per person	69,057
17	Total Use of Water within the Region	N/A	N/A	#####	N/A	N/A	#####	N/A	N/A	355,384	N/A	N/A	291,950	N/A	N/A	338,135	N/A	N/A	350,039
18	Net	N/A	N/A	0	N/A	N/A	9,000	N/A	N/A	0	N/A	N/A	38,050	N/A	N/A	-1,383,411	N/A	N/A	-1,444,039

Assumptions of Advocates

		Environmental		Urban Users & Economic Development		Agricultural / Historical / Cultural Advocates			
		Desired Year 2050 Use Budget		Desired Year 2050 Use Budget		Desired Year 2050 Use Budget - Scenario 1		Desired Year 2050 Use Budget - Scenario 2	
Water Line Item		C	Assumptions	C	Assumptions	C	Assumptions	C	Assumptions
		Total Water Use (afpy)		Total Water Use (afpy)		Total Water Use (afpy)		Total Water Use (afpy)	
<i>Inflows to the Middle Rio Grande Region</i>									
1	Rio Grande Native Inflows	1,100,000		1,100,000		1,100,000		1,100,000	
2	Tributary and Groundwater Inflows	245,000		245,000		245,000		245,000	
3	San Juan/Chama Inflows	74,000		74,000		74,000		74,000	
4	Imports from Socorro/Sierra Region	0		10,000	Water transfer through open market	0,000		0,000	
5	Imports from Other Sources (must identify the source)	0,000		0,000		0,000		0,000	
6	Urban Storm Drain Inflow	8,000	increased urbanization expected to increase runoff	10,000	Increase urbanization will cause more pavement with more rain water run off	5,000		5,000	
7	Total Water Income to the Region	1,427,000		1,439,000		1,424,000	Inflows stayed constant	1,424,000	
<i>Uses of Water within the Region</i>									
8	Elephant Butte Lake Evaporation	124,000		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.	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.	144,000	Any solution or reduction is nigh impossible
9	Socorro/Sierra Region Current Deliveriv Rate	100,000		90,000	Imported 10,000 above	100,000		100,000	
10	Rio Grande Compact Deliveries	850,000		850,000	Beneficial changes to Compact deliveries appear to be impossible (UUED Group would like to see if this can be negotiated)	850,000		850,000	Beneficial changes to Compact deliveries appear to be impossible
11	Total Required Deliveries Outside of the Region	1,074,000		1,057,000		1,068,616		1,094,000	
<i>Uses of Water within the Region</i>									
12	Riparian Uses	135,000 / 10,000	includes 10,000 afpy for instream flows	##### ###	Increase open space within the bosque and decrease non-native plants to decrease consumptive use	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.	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)	##### ###		##### ###	Reduce evaporation in open ditches and lessen conveyance losses	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)	60,000	Added 10,000 acres of former riparian as maintenance . Extra water from ag. Conservation
14	Irrigated Agriculture Uses	##### ###	expect a small increase in irrigation efficiency	##### ###	Kept ag lands to same 2050 amount; increased efficiency (10%) while maintaining shallow aquifer benefits	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.	61,200	
15	Office, Business, Commercial, and Industrial Uses	##### ###	water for new uses must be obtained by conservation	##### ###	Used BBER predicted jobs and require increase water efficiency by 30 % from today's use.		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 "domestic" uses.	18,250	jobs reduced to fit resource availability
16	Domestic Uses	##### ###	water for new uses must be obtained by conservation	##### ###	Used FWUP predicted population and require increase water efficiency by 30 % from today's use.	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.	40,000	jobs reduced to fit resource availability
17	Total Use of Water within the Region	##### ###		##### ###		355,384		291,950	
18	Net	0		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.	0		38,050	

Assumptions of Specialists

		Minimum Year 2050 Use Budget			Maximum Year 2050 Use Budget	
Water Line Item		C Total Water Use (afpy)	Assumptions	Minimum, No Change to EB	C Total Water Use (afpy)	Assumptions
Inflows to the Middle Rio Grande Region						
1	Rio Grande Native Inflows	1,100,000		1,100,000	1,100,000	
2	Tributary and Groundwater Inflows	245,000		245,000	245,000	
3	San Juan/Chama Inflows	74,000		74,000	74,000	
4	Imports from Socorro/Sierra Region	____,000		____,000	____,000	
5	Imports from Other Sources (must identify the source)	____,000		____,000	____,000	
6	Urban Storm Drain Inflow	5,000		5,000	5,000	
7	Total Water Income to the Region	1,424,000	No changes	1,424,000	1,424,000	
Uses of Water within the Region						
8	Elephant Butte Lake Evaporation	95,276	12,000 acres (25% reduction); Evap/Acre 9 _ 8 (Evaporation rate reduction of ~ 12% from 9 _ 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.	144,000	144,000	
9	Socorro/Sierra Region Current Delivery Rate	100,000		100,000	100,000	
10	Rio Grande Compact Deliveries	850,000		850,000	850,000	
11	Total Required Deliveries Outside of the Region	1,045,276		1,094,000	1,094,000	
Uses of Water within the Region						
12	Riparian Uses	107,476	Changed ET/Acre from 3 to 2.39 (20% reduction)	107,476	107,476	
13	Open Water Uses (Other than Elephant Butte)	60,000	River areas = Rio Grande 6900 acres & Jemez 2600 acres. Conversion to closed conduit (main laterals and drains) was judged to be ~10% due to slope constraints, etc. or about 83.4 miles that could be converted.	60,000	60,000	
14	Irrigated Agriculture Uses	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.	59,405	59,405	
15	Office, Business, Commercial, and Industrial Uses	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%)	42,197	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	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.	69,057	69,057	Population. 712,000 to 1,500,000 people (210%) (based on FWUP Series C); Per Capita use 0.08 to 0.06 (75%); Total Use 57,000 to 90,000 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	338,135		338,135	350,039	
18	Net	40,589		-8,135	-20,039	
			??	-7,951		

Lee, here are the notes from the March 2 meeting. There was a fair amount of discussion on what a "maximum" and "minimum" scenario was supposed to represent. I didn't capture a lot of the discussion since we revisited the topic on several occasions during the meeting. One point that I noted was that the changes made to the baseline in the model are to be made on "known" or "feasible" approaches that "could" be done. The actual ability or refinement of these scenarios might reflect the more detailed information that results for the alternatives analysis. You also proposed that we stay away from political or economic or other judgment decisions as much as possible.

We decided on two Minimum Scenarios. One that includes Elephant Butte and one that excludes savings from that area. The deficits in the second minimum scenario reflected by the lack of Elephant Butte savings would be made up by water imports from other regions/sources.

The proposed new Maximum will be the minimum scenario with the population and jobs pushing the higher numbers. The efficiencies will continue to reflect the "minimum" numbers established.

Also note that a major change in our previous minimum model from February 9th, was the change to the "Socorro & Sierra Deliveries" element. We had assigned a 20% reduction to these deliveries based on a transfer of water from rural/Ag to urban.

We continued to work on defining "consumptive" use for Business & Government and Residential Uses. A lot of discussion on these two elements.

"Minimum Scenario #1 - Elephant Butte" 2050 projection

Elements	Units	Units, % of 30-yr. Avg.	Per Unit Use	Per Unit Use, % of 30-yr. Avg.	Subtotal	Subtotal, % of 30-yr. Avg.
Rio Grande Compact					850,000	
Elephant Butte Evaporation	11,964	75%	7.96	88%	95,276	66%
Socorro & Sierra Deliveries					100,000	100%
Riparian Use	45,000	100%	2.39	80%	107,476	80%
Open Water Evaporation	12,000	100%	5	100%	60,000	100%
Irrigated Agriculture	33,970	71%	1.75	83%	59,405	59%
Business & Government	551,196	161%	0.08	80%	42,197	128%
Residential Uses	1,150,943	161 %	0.06	75%	69,057	111%
Renewable Water					1,424,000	
Water Use					1,383,410	
Water Balance					40,590	

Summary of Assumptions:

Total Water Inflows (25 yr avg 72-99)	<p>Native Rio Grande 1,100,00 Trib & Ground wtr 245,000 San Juan/Chama 55,000 Imports 0 Imports - other 0 Urban Storm Drains 5,000 Totals 1,426,000 (No changes)</p>
Rio Grande Compact	<p>The Budgeting: <u>25 yr avg</u> <u>2020</u> <u>2050</u> RGC oblig. 845,000 845k 845k (No changes)</p>
Elephant Butte Evap	<p>Surf. Ac.-16,000 12,000 acres (25% reduction) Evap/Acre 9 8 (Evaporation rate reduction of ~ 12% from 9 8 based on reduced surface area) Total Use 140,000 95,276 ac-ft. (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.</p>
Socorro & Sierra Deliveries	<p>Ac. Ft.-100,000 Originally reducing by 20% at last meeting. Based on research, transfer of that much water may prove too contentious to be practical.</p>
Riparian Use	<p>Surf. Ac.-45,000 acres (constant) ET/Acre 3 2.39 (20% reduction) Total Use 125,000 107,476 ac-ft. (see 1-26 meeting minutes-same values) No change from previous meeting</p>
Open Water Evaporation	<p>Open water acreage and evap/acre left as is based on Corine's report. No change from February 9th meeting.</p>
Irrigated Agriculture	<p>Surf. Ac.-48,000 34,000 acres (30% reduction) (based on revised acreage projections from Ag team) ET/Acre 2.1 1.75 (17% reduction) Total Use 100,000 59,712 ac-ft. (40% reduction in consumptive use) No changes from February 9th meeting, additional crop changes, etc. could drive this lower.</p>
Business & Government	<p>Jobs.-343,000 550,000 (152%) (based on Series B) Per Job use 0.096 0.08 (79%) Total Use 33,000 42,197 ac-ft. (111%)</p>
Residential Uses	<p>Population.-712,000 1,150,943 people (161%) (based on Series B)</p>

	Per Capita use 0.08 0.06 (75%) Total Use 57,000 80,362 ac-ft. (128%) Population was increased based on (Series C). Basis is Mike and Joanne's report. Consumptive use projected as 0.08 to 0.06 ac- ft/person, based on Joanne's report. More work needed on this.
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Discussion on 2050 Minimum Scenario #1:

Discussion on establishing the boundary conditions for maximum and minimum scenario's was revisited.

Elephant Butte Evap - model parameters based on relocating reservoir storage to northern environment where evaporation is reduced. Recreation use and addressing compact, irrigation district, etc. was preserved by maintaining minimum level. Other options also exist including use of surfactants (future discussion) or storage in underground reservoir (Albuquerque). Compact requirements would be met by 55,000 ac-ft level as well. Also noted that reducing Elephant Butte level would require some channels in delta area to prevent increasing evaporation. For 2-9 meeting we used the new reservoir scenario. **Note: This would require a modification of the compact.**

Rio Grande Compact - no discussion at this time

Riparian Use - Stayed with parameters established at 1-26 meeting. Reduced ET by making it more open riparian leaving cotton woods. Discussions on acreage parameter no basis was established to increase or reduce.

Irrigated Agriculture Corrine presented an assessment by committee to investigate "Irrigated Agriculture" category. Justification for reducing the 2050 conversion of farmland to urban use or transfer of water rights suggested a budget surface acres of 34,000 and validated the ET/acre change from 2.1 to 1.75. Lots of discussion on this but team decided to accept these parameters with recognition that these parameters can be adjusted with future data. Note: The acreage number is an adjustment up from the 2050 projection of 29,000 acre. No changes from last meeting, additional crop changes, etc. could drive this lower.

Open Water Evaporation Corine's report out noted that figures for open water evap should reflect a 1997 BOR study. Discussion on amount of ditch inventory that could be converted to an enclosed conduit (main laterals and drains) was judged to be ~10% due to slope constraints, etc. This would be about 83.4 miles that could be converted.

River areas would be Rio Grande 6900 acres and Jemez would be 2600 acres.

Total Water Inflows - Report out by Corrine. No change to Inflow number, but good information on water shed impacts to inflow. Recommendation to modeling team: Need to consider making "Tributaries and Groundwater" field an adjustable parameter. Notes in her research that water shed yields are declining indicating that water shed health needs to be on list of alternatives.

Rio Grande Compact Deliveries - Steve's report-out notes lots of opportunities for all three states in modifying/renegotiating compact. List of win-win-win items in document. Suggestion that "opportunities" noted

should be compiled by AC in format that could be communicated to these potential proponents for a renegotiation. No changes made to Compact deliveries. Note: Need to cross-reference back to Elephant Butte changes proposed by Mike. Water saved moving reservoir north might have to be shared with other compact participants.

Socorro & Sierra Deliveries Noted that there is some water movement from Socorro county at this time. No quantity of moved water available. Constraint is pre-1907 waters are becoming increasingly scarce. Conservancy district waters are the remainder which are a political and legal issue with regards to moving to other use. Constraint on importation of water from these areas is political rather than legal. Already a contentious issue.

Note that at 1-26 meeting we proposed transfer of 20,000 ac-ft. For the 3-02 meeting we went back to full 100,000 ac-ft number

Residential Use Review of this category by Joanne and Mike generated a lower population projection (Series C) 1,150,000 as this "minimum" scenario. Per capita "consumption" was projected to go to 0.06 ac-ft. Since most municipalities track and report water use as a combined use number (residential, commercial, etc.) on a per capita basis, Mike reported its difficult to break out these two use categories as well as determining a "consumptive" element. Mike will refine these numbers.

Business & Government The challenge between residential and business remains that actual data available from municipalities is a combined number. This "consumptive use" was balanced based on Albuquerque and El Paso. Mike's doing more work on this.

"Minimum Scenario #2 - Elephant Butte" 2050 projection

Elements	Units	Units, % of 30-yr. Avg.	Per Unit Use	Per Unit Use, % of 30-yr. Avg.	Subtotal	Subtotal, % of 30-yr. Avg.
Rio Grande Compact					850,000	
Elephant Butte Evaporation	16,000	100%	9.0	100%	144,000	100%
Socorro & Sierra Deliveries					100,000	100%
Riparian Use	45,000	100%	2.39	80%	107,476	80%
Open Water Evaporation	12,000	100%	5	100%	60,000	100%
Irrigated Agriculture	33,970	71%	1.75	83%	59,405	59%
Business & Government	551,196	161%	0.08	80%	42,197	128%
Residential Uses	1,150,943	161 %	0.06	75%	69,057	111%
Renewable Water					1,424,000	
Water Use					1,431,951	
Water Balance					-7951	

Discussion on 2050 Minimum Scenario #2:

The second minimum scenario eliminates the Elephant Butte relocation strategy of scenario #1 and water balance deficit is assumed to be met through a water import strategy.

"Maximum" 2050 projection

Elements	Units	Units, % of 30-yr. Avg.	Per Unit Use	Per Unit Use, % of 30-yr. Avg.	Subtotal	Subtotal, % of 30-yr. Avg.
Rio Grande Compact					850,000	
Elephant Butte Evaporation	16,000	100%	9.0	100%	144,000	100%
Socorro & Sierra Deliveries					100,000	100%
Riparian Use	45,000	100%	2.39	80%	107,476	80%
Open Water Evaporation	12,000	100%	5	100%	60,000	100%
Irrigated Agriculture	33,970	71%	1.75	83%	59,405	59%
Business & Government	707,000	206%	0.08	80%	54,101	164%
Residential Uses	1,500,000	161 %	0.06	75%	69,057	111%
Renewable Water					1,424,000	
Water Use					1,444,039	
Water Balance					-20,039	

Summary of Assumptions:

Business & Government	Jobs.-343,000 Per Job use 0.096 Total Use 33,000 707,000 (206%) (based on Series B) 0.08 (79%) 54,101 ac-ft. (164%)
Residential Uses	Population.-712,000 Per Capita use 0.08 Total Use 57,000 1,500,000 people (210%) (based on Series C) 0.06 (75%) 90,000 ac-ft. (128%) Population was increased based on (Series C). Basis is Mike and Joanne's report. Consumptive use projected as 0.08 to 0.06 ac-ft/person, based on Joanne's report.

Discussion on 2050 Maximum:

Discussion on establishing the boundary conditions for maximum and minimum scenario's was revisited. The major changes to derive the maximum vs. the minimum scenario #1 are as follows:

Elephant Butte Evap - No change to current Elephant Butte Evap model.

Residential Use Used a higher end of population growth projections (Series C) 1,500,000. Per capita consumptive use was projected to go to 0.06 ac-ft per Mike's previous recommendations in the minimum scenarios.

Business & Government The job projections were also loaded to the higher end of projections (Also Series C). The Consumptive use was reduced to 0.08 per Mike's recommendations in the minimum scenarios.