Supporting Document E-3

Full Alternative Tracking Matrix

Original Number	Category	Id No.	Consolidated Actions	Rated & Redefined Actions	Category	Alternative Actions	Description
33 65 66 124 126 170 202	River/Bosque Management	A-1	Restore Bosque "mosaic" and manage vegetation in the Bosque to reduce evapotranspiration	Restore Bosque "mosaic" and manage vegetation in the Bosque to reduce evapotranspiration by selectively removing vegetation and promoting native plants.	Increase Water Supply	Restore Bosque habitat and manage vegetation in the Bosque to reduce evapotranspiration by selectively removing vegetation and promoting native plants.	For example, the Russian olive and salt cedar trees are high water consumers and inhibit the growth of other low-water plants. Return the Bosque either to cottonwood or a mosaic of grasses, trees and shrubs . Research is underway to determine how much water would be saved.
67 130	River/Bosque Management	A-2	Develop economic potential of non-native species removal	Develop economic potential of non-native species removal, harvesting, and output of products by local industries.	Increase Water Supply	Develop economic potential of non-native species removal, harvesting, and output of products by local industries.	The objective is to develop products that use the plants being removed by vegetation management programs. If implemented successfully, this could become an income source rather than a cost.
58 159 267	Agricultural, Cultural and Historic Use	A-7	Meter surface water distribution flows	Meter and manage surface water distribution flows through all irrigation systems to conserve water.	Decrease or Regulate Demand	Meter and manage surface water distribution flows through all irrigation systems to conserve water.	Allows the accurate measurement of permitted water use and associated losses. Metering by itself may encourage conservation.
72 97 232	Agricultural, Cultural and Historic Use	A-8	Meter all wells	Meter all wells, including domestic wells, throughout the water planning region.	Decrease or Regulate Demand	Meter all water supply wells, including domestic wells, throughout the water planning region.	Under the current system, domestic wells owners are allowed up to 3 acre-feet per year. Metering is not required so there is no way to monitor actual water use. Once the amount of water being used is known, there may be an incentive to use less of it.
60 134 151 265		A-9			Agricultural, Cultural and Historic Use	Develop conveyance alternatives for water transportation in agricultural irrigation systems.	Most Irrigation systems in the MRG planning region deliver water and carry some return drainage flow through unlined ditches (canals). Off-farm irrigation water losses exist as riparian evapotranspiration, seepage, illegal diversion, and canal breaches, resulting in substantial amounts of water not being delivered to users. This alternative action calls for the study of the off-farm conveyance issues and proposed solutions such as various types and combinations of canal lining systems, pipes, and improved diversion and regulatory structures, to reduce losses preferably without impacting aesthetics. Such changes will improve irrigation efficiency and conservation, resulting in diverted water savings.
61 174	Agricultural, Cultural and Historic Use	A-10	Develop and employ alternatives for irrigation efficiency	Develop and employ alternatives to maximize irrigation efficiency on all agricultural croplands in the region.	Decrease or Regulate Demand	Develop and employ alternatives to maximize irrigation efficiency on all irrigated land in the region.	This is a follow-up to alternative A-7. Mechanisms include, but are not limited to: 1. Install drip, sprinkler, surge, or furrow irrigation where feasible. Note that this doesn't work for many farm crops, like alfalfa. 2. Laser-level fields to remove depressions where [excess] irrigation water settles. 3. Aggrega to the small strip farm plots so th t ltern tives become cost
59 64 136 158	Agricultural, Cultural and Historic Use	A-11	Develop markets for alternative crops.	Develop local markets for locally-grown produce, and low-water alternative crops.	Change Water Use	Develop local markets for locally grown produce, and low-water alternative crops.	Increasing production of low-water alternative crops would reduce overall dependence on water. Research is required to identify the crops and the markets, and plan for the transition. Investigate the associated costs, labor, and time requirements.
41 88	Urban Water Management	A-15	Continue to draw deep-well water for drinking purposes	Preserve, but continue to draw deep-well water for drinking purposes only.	Implementation of Plan - Management	Preserve, but continue to draw deep-well water for drinking purposes only.	Removing vast quantities of water from the aquifer is lowering the water table and creating various surface water problems. Proposal is to limit consumption of aquifer waters for drinking purposes only and obtain water for other purposes from other sources. The technical issue is how to deliver two grades of water to urban user. Installation of a dual-piping system is quite costly for existing construction. An alternative is to make treated river water available from the taps and provide ground water in bottled form.
7 49 51 75 76 135 147 149 184 200 210 211 244 45	Urban Water Management	A-18	Adopt and implement local water conservation plans and programs.	Adopt and implement local water conservation plans and programs in all municipal and county jurisdictions, including drought contingency plans. [INCORPORATES A-65]	Decrease or Regulate Demand	Adopt and implement local water conservation plans and programs in all municipal and county jurisdictions, including drought contingency plans.	Many programs are possible, for example, publicity campaigns, pricing schemes, or installation of low-flow devices. Encourage xeriscaping and drip irrigation. For example, bluegrass requires three times as much water as does native gramma or buffalo grass. In urban areas, where half or more of total water use is for landscaping, the substitution of low-water-use plants for high-water use varieties will save significant amounts of water. Note that groundwater pumping supplements river flow when it is returned as waste water. Therefore, reducing pumping will result in less return flow to the river, with its consequences, both to the environment and to the State's ability to meet its Compact obligations.

150 177 190 191 246 187	Urban Water Management	A-21	Examine a variety of conservation-oriented water pricing mechanisms and utilize those most effective at conserving water. The mechanisms to be examined include: a. Price water to reflect the true value; b. Institute a moderately increasing block price schedule; c. Institute a steeply increasing block price	Examine a variety of water pricing mechanisms and adopt those that are most effective at conserving water. The mechanisms to be examined include: a) price water to reflect the true value; b) institute a moderately increasing block price schedule; c) institute a steeply increasing block price schedule; and d) other	Decrease or Regulate Demand	Examine a variety of water pricing mechanisms and adopt those that are most effective at conserving water. The mechanisms to be examined include: a) price water to reflect the true value; b) institute a moderately increasing block price schedule; c) institute a steeply increasing block price schedule; and d) other feasible incentives and subsidies for conserving water.	The mechanisms to be examined include, but are not limited to 1. pricing water to reflect the true value; 2. instituting a moderately increasing block price schedule; 3. instituting a steeply increasing block price schedule. In order to implement and enforce several of these mechanisms, metering and recording are necessary.
189 52 188	Urban Water Management	A-22	Provide subsidies for adoption of water efficient technologies.	Provide local government programs that offer subsidies for adoption of water efficient technologies and utilization of water saving devices.	Decrease or Regulate Demand	Provide local government programs that offer subsidies for adoption of water efficient technologies and utilization of water saving devices.	Promote the transition to water-saving devices and water-efficient technologies through incentives sponsored at the local level. (This could apply to both municipal and industrial customers.)
201 74	Urban Water Management	A-24	Promote, through incentives, on-site residential and commercial greywater reuse and rainwater harvesting.	Promote, through incentives, on-site residential and commercial greywater reuse.	Increase Water Supply	Promote, through incentives, on-site residential and commercial greywater reuse and recycling	Provide incentives to implement greywater reuse systems in residential and commercial properties. Greywater reuse systems would require separate on-site plumbing which makes them more expensive to implement. Considerations also include defining standards for the level of treatment for greywater so that it is healthy enough for nonpotable uses. For example, how to mitigate the presence of household chemicals and biological hazards in greywater.
209 79	Urban Water Management	A-26	Expand use of centralized wastewater collection and treatment systems	Expand use of centralized wastewater collection and treatment systems into all areas of urban and suburban development within the water planning region.	Water Quality Protection	Expand use of centralized wastewater collection and treatment systems into all areas of urban and suburban development within the water planning region.	Certain areas of the region rely on septic tank systems which do not adequately purify the water before it returns to the groundwater. Technical limits such as distance and pipeline size make implementation costly.
83 84 183	Urban Water Management	A-27	Reuse treated wastewater.	Reuse treated wastewater for non-potable municipal uses.	Increase Water Supply	Reuse treated wastewater for non-potable uses.	The cost to bring wastewater to a state where it can be used for watering lawns, etc., is much lower than cleaning the water to a drinkable level. Find a way to distribute the treated wastewater for any or all non-drinking needs. The treated wastewater can be reused once or several times before it is returned to the river or lost to evaporation. Several implementation approaches are possible. One approach is to retrofit homes and businesses with a second set of water pipes. Another approach is to apply this to new construction only.
70 71 178 245 163	Urban Water Management	A-28	Increase building densities (as compared to typical suburban density) and infill development.	Increase building densities (as compared to typical suburban density) and infill development through adoption of local government land use policies and regulations.	Change Water Use	Increase building densities (as compared to typical suburban density) and infill development through adoption of local government land use policies and regulations.	This would be accomplished through local government land use policies, regulations, and incentives. Implementing this would require regulatory changes at the local level, for example, making house lots smaller or building multi-story dwellings. Higher-density development would reduce the relative footage of landscaping and associated water use
8 16 15 68	Watershed Management	A-30	Integrate land use planning and water resource management	Adopt policies to integrate land use planning and water resource management in all government jurisdictions in the Middle Rio Grande water planning region.	Change Water Use	Adopt policies to integrate land use planning and water resource management in all government jurisdictions in the Middle Rio Grande water planning region.	Take water supply limitations into account when making land use development decisions. Develop mechanisms for local governments to adopt policies that coordinate water impact considerations with all land development and other uses of water.
20 21 207 231 38	Watershed Management	A-33	Establish erosion prevention measures and use soil management techniques to reduce runoff and increase infiltration	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. [INCORPORATES A-32]	Increase Water Supply	Establish erosion prevention measures and use soil and vegetation management techniques to reduce runoff and increase infiltration throughout the watershed, including forested mountains and uplands.	Expand watershed management programs. These programs are intended to slow runoff and reduce erosion through various means, for example, installing better groundcover, restoring grasslands and canopy environment, and controlling watercourse drainage. Establish vegetation management programs. Regional forests, including the Bosque, are currently full of small diameter trees and brush. This not only presents a fire hazard, but it also consumes water and prevents natural infiltration of rainwater and snowmelt.
77 180 39 143 144 179 148 152 91	Watershed Management	A-34	Enhance & expand local government programs to control storm water runoff using swales, terraces, and retention structures to minimize erosion and enhance infiltration/ recharge	Enhance and expand local government drainage plans and programs to control storm water runoff using swales, terraces, and retention structures to minimize erosion, enhance infiltration and recharge, and prevent pollution of surface and ground water. [INCORPORATES A-35]	Increase Water Supply	Enhance and expand local government storm water plans and programs to control runoff using swales, terraces, and retention structures to minimize erosion, enhance infiltration and recharge, and prevent pollution of surface and ground water.	The majority of local governments in the region do not have programs of this nature because the cost is relatively high and the benefits are either long-term or indirect.
173 196 253	Watershed Management	A-36	Create constructed wetlands for groundwater recharge, water harvesting, and habitat improvement, and hydrological management of the Rio Grande	Create constructed wetlands where feasible for groundwater recharge, water harvesting, and habitat improvement, and hydrological management of the Rio Grande.	Increase Water Supply	Create constructed wetlands where feasible for groundwater recharge, water harvesting, and habitat improvement, and hydrological management of the Rio Grande.	Use constructed wetlands as an alternative method for treatment of sewage and other forms of greywater. Technical considerations include the difficulty of protecting the wetland plants from destruction by heavy downpour and floods. In addition, a significant amount of water is lost to evaporation and evapotranspiration.
259	Public Policy Actions	A-38	Protection of excess water flow from Elephant Butte Reservoir during wet cycles	Protection of excess water flow from Elephant Butte Reservoir during wet cycles.	Increase Water Supply	Increase monitoring and modeling of surface water system to improve water management at the watershed level, and retain excess water flow from Elephant Butte Reservoir during wet cycles. [INCORPORATES A-41]	Under the Rio Grande Compact, NM accrues credits for excess water flow and debits for deficits. A spillover of the Elephant Butte dam wipes out all accumulated debits. Proposal is to improve monitoring of the snow pack so that NM is able to predict how much water to let flow down to Elephant Butte and thereby manage the wet year water excess to NM' s best interest.

22	Groundwater Aquifer Management	A-39	Promote and use technological advances for treating saline and brackish water	Utilize technological advances for treating deep saline and brackish water for potable or non-potable use in the region.	Increase Water Supply	Utilize technological advances for treating deep saline and brackish water for potable or non-potable use in the region.	Desalination is used in various parts of the world to obtain fresh water. These techniques could be applied to brackish water in several of the NM basins, or even to ocean water. Possible sources: Tularosa basin (near Alamogordo); an unnamed basin West of Albuquerque; Gulf of California or other ocean. Brackish water may be available at the bottom of Rio Grande basin. There are significant technical, economic, and environmental issues associated with this, including the cost of desalination, disposal of brine waste, and the cost of deep water pumping.
23	Watershed Management	A-40	Continue evapotranspiration studies and apply findings to vegetation management	Continue evapotranspiration studies and apply findings to vegetation management programs in the water planning region.	Increase Water Supply	Continue evapotranspiration studies and apply findings to vegetation management programs in the water planning region.	Evapotranspiration is the water given off by plants. More research is needed to understand how much water comes from which types of plants and under what conditions. Use this information to minimize riparian water loss.
44 261 48	Watershed Management	A-42	Utilize State & Federal labs to conduct research on water supply enhancement techniques such as weather modification	Utilize State & Federal labs to conduct research on innovative water supply enhancement techniques such as weather modification.	Increase Water Supply	Conduct research on innovative water supply enhancement techniques such as weather modification.	If a way is found to do this effectively in this region, it could create additional water supply. This is a highly experimental field.
18	Watershed Management	A-44	Encourage on-site water harvesting	Encourage on-site rainwater harvesting	Increase Water Supply	Encourage on-site rainwater harvesting	The vast majority of rainfall is lost to evaporation. If a percentage of this rain could be collected, it would provide a significant additional source of water. There are legal issues concerning impoundment of storm water and impairment of water rights as well as issues bearing on the quality of harvested water.
29 30 43 182 243 247 263 37	Watershed Management	A-45	Reduce open water evaporation in storage reservoirs by retaining water at higher elevations or latitudes, or by reducing surface areas	Reduce open water evaporation in storage reservoirs by retaining water at higher elevations or latitudes, or by reducing surface areas.	Increase Water Supply	Reduce open water evaporation in storage reservoirs by retaining water at higher elevations or latitudes, or by reducing surface areas.	Under the provisions of the Rio Grande Compact, NM must reserve a certain amount of water in the Elephant Butte reservoir for use by Texas. Both the shape of the reservoir, which has been compared to a champagne glass, and the location, which is in a hot area of the state, contribute to a high percentage of evaporation. Water lost to evaporation is not counted toward the deliverable to Texas. Proposal is to reduce the amount of water lost to evaporation by any of various means, including, 1. Cover Elephant Butte Lake with surfactants, a thin layer of goop that would reduce evaporation. SNL is working to develop a non-hazardous product that would do this. 2. Store some or all of the water in a cooler region. With a better management plan, it might be possible to minimize the water sent to Elephant Butte and keep it in a cooler region of the st. to. Or, it may be
90 81	Groundwater Aquifer Management	A-46	Inject water for aquifer storage that has been treated to drinking water standards	Inject water treated to drinking water standards for aquifer storage in appropriate locations throughout the water planning region.	Increase Water Supply	Inject water treated to drinking water standards for aquifer storage in appropriate locations throughout the water planning region.	Use the aquifer as interim storage for surplus water. It may be possible to pump surplus water back into the aquifer. Technical issues exist regarding quality of the water to be injected. It is not known how much of the water would be retrievable. Further research is needed.
82 87 95	Groundwater Aquifer Management	A-47	Identify, protect and monitor areas vulnerable to contamination	Identify, protect and monitor areas vulnerable to contamination and restrict domestic wells in sensitive areas. [INCORPORATES A-48]	Water Quality Protection	Identify, protect and monitor areas vulnerable to contamination (quality issue) and restrict groundwater supply wells in sensitive areas.	This is a particular issue where there is a high-density of shallow wells, septic systems, and leaking storage tanks. Development near many public wells is not monitored or controlled and could create sources of contamination of the public water supply. In addition, high concentrations of domestic wells in close proximity to septic systems represent a serious regional water contamination issue. Local governments do not keep records on the relative placement of wells and
226	Groundwater Aquifer Management	A-50	Establish wellhead protection programs on all public water supply wells	Establish wellhead protection programs on all public water supply wells within local government jurisdictions.	Water Quality Protection	Enforce wellhead protection programs on all public water supply wells within local government jurisdictions.	Federal and State regulations stipulate that public water supply wellheads must be protected to prevent contamination of groundwater. These regulations are not enforced. Most communities lack wellhead protection programs.
176	Public Policy Actions	A-51	Account for evaporation losses and charge Texas for banking their compact water	Establish more equitable accounting for evaporative losses in Rio Grande Compact water.	Water Rights	Establish more equitable accounting for evaporative losses in Rio Grande Compact water.	Per the Rio Grande compact, NM is required to keep a certain amount of water in Elephant Butte reservoir A large amount of the water in the reservoir is lost to evaporation. The evaporative loss would normally be shared among all water users, both Texas and New Mexico. Change the Compact so that Texas is responsible for some of the evaporative loss, which would reduce the delivery amount that New Mexico owes Texas. Renegotiating the Compact is highly unlikely.
197 206 215 217 219 220 240 55	Public Policy Actions	A-52	Develop, adopt and implement a sustainable and coordinated growth plan in the middle Rio Grande.	Develop, adopt a d implement a sustainable and coordinated growth management plan for local governments in the middle Rio Grande region in order to reduce water consumption and minimize impact on water resources. [INCORPORATES A-01]	Implementation of Plan - Management	Develop a sustai able a d coordinated growth management plan for adoption and implementation by local governments in the middle Rio Grande region in order to: 1) reduce water consumption; 2) minimize impact on water resources; 3) encourage conservation-oriented economic	Ma age growth r order to reduce water co sumptio , mi imize impact o water resources, and encourage conservation-oriented economic development. A number of political issues affect this alternative, including: 1. Water authority is at the State level; land use authority is vested at the local level. Coordination would require one oversight agency. 2. There is both strong support and strong opposition to this alternative.
111 112 113 114 116 146 203 117	Public Policy Actions	A-53	Through ope a d inclusive processes, ensure public involvement in water planning by establishing regular public information/dissemination program and public relations campaign, and citizen planning committees. Keep public	Through ope a d inclusive processes, ensure public involvement in water planning by establishing regular public information/dissemination program and public relations campaign, and citizen planning committees. Keep the	Decrease or Regulate Demand	Through open and inclusive processes, ensure public involvement in water planning by continuing regular public information/dissemination programs and public relations campaigns, and citizen planning committees. Keep the public engaged in this process.	The theory is that as the public becomes better informed of the scale and complexity of the problems, there will be more pressure for change. People who understand the problem will be motivated to conserve water. Public participation ensures that a broad array of interests is represented.
198 241 98	Public Policy Actions	A-56	Establish regional programs to encourage voluntary conservation of water.	Establish region-wide educational programs to encourage voluntary conservation of water.	Decrease or Regulate Demand	Establish region-wide educational programs, including public and private school curricula, to encourage voluntary conservation of water. [INCORPORATES A-54]	Over the long-term this will raise consciousness and change lifestyle use of water.
264	Public Policy Actions	A-58	Dedicate and continue funding for Regional Water Planning	Dedicate and continue funding for Regional Water Planning as an ongoing process and as a basis for water management at local, regional and state levels.	Funding	Establish dedicated and continuing funding for Regional Water Planning as an ongoing process and as a basis for water management at local, regional and state levels.	The Regional Water Plan (RWP), once submitted and approved, will require periodic revision.
132	Public Policy Actions	A-59	Establish State-based severance tax for water planning and conservation	Establish a State-based severance tax for water planning and conservation.	Funding	Establish a State-based water severance tax for water projects, planning and conservation.	The proposal is to tax the net withdrawal of water from the water system, especially ground water which is being depleted at a higher rate than it is being recharged. Establishing a severance tax or other taxing mechanism would implicitly recognize water as a State resource. The income could be used to fund other water management implementations.

96	Agricultural Cultural Historic	A-60	Fund acequias to help with water conservation programs.	Fund acequias to develop and implement water conservation programs.	Decrease or Regulate Demand	Fund acequias to develop and implement water conservation programs.	There are two common types of irrigation organizations: traditional acequias and Conservancy District ditches. The approach to conserving may differ whether one considers traditional community acequias or conservancy district acequias. Conservancy district acequias tend to be much larger and might require federal funding to implement the changes. Note: The Conservancy District of the MRG was created in 1924 to manage water delivery along the Rio Grande between Cochiti lake to Elephant Butte. The district taxes property owners to fund management of the ditches and dams.
192	Public Policy Actions	A-61	Legislate a reduction of pumping from private domestic wells	Legislate a reduction of pumping limitations from all private domestic wells.	Decrease or Regulate Demand	Reduce the allowed pumping from domestic wells and restrict drilling of domestic wells where surface waters or the aquifer could be impaired.	This alternative requires that well metering be in place.
157 133	Public Policy Actions	A-63	Change state water law to include in-stream flow as a beneficial use	Change state water law to include in-stream flow as a beneficial use.	Water Rights	Change state water law to include in-stream flow as a beneficial use.	Under current law, to maintain a water right, you must put it to beneficial use. Water flowing in the river, known as " in-stream flow," has not been declared a beneficial use in New Mexico. However, the health of the river affects state parks and animals that live in the river environment. By determining beneficial use to include in-stream flow there would be some legal protection for riparian uses of water.
3 2	Public Policy Actions	A-66	Implement local/regional watershed management plans.	Implement local and regional watershed management plans through all water agencies in the planning area.	Increase Water Supply	Implement local and regional watershed management plans through all land and water agencies in the planning area.	Once a water plan is agreed upon, coordinate the implementation among the numerous agencies at local, state, tribal, and federal level, which have some jurisdiction in the matter.
103 104 212 12 13 266 269 24	Public Policy Actions	A-67	Establish a regional water management authority	Establish a regional water management authority to provide professional water resource management and to administer or assist in a water banking program. [INCORPORATES A-49]	Implementation of Plan - Management	Establish a regional water management authority to provide professional water resource management and to administer or assist in a water banking program.	A regional authority can provide coordination and consistent implementation of the regional water plan. Currently, water management is under the authority of various federal, tribal, state, and local departments. Water banking is a term used for several different concepts. It may be used to allow the authorized agency to make decisions about water transfers quickly. Water banking is also used to denote a system of leasing out unused water to avoid losing water rights. However, water banking may be detrimental to the Acequia systems.
250 251 252 254 256 262 236	Public Policy Actions	A-69	Acquire additional water rights without condemnation	Acquire additional water rights without condemnation from various sources from within or outside the water planning region, and import water from other basins where possible. [INCORPORATES A-37] [INCORPORATES A-43]	Increase Water Supply	Acquire additional water rights without condemnation from various sources from within or outside the water planning region, and import water from other basins where possible.	Under NM law, water rights are a property right and can therefore be condemned if it is in the public interest to appropriate the water for another use. It is becoming increasingly difficult to find willing sellers and the cost to purchase and transfer water from place to place is quite high.
46 101 107 268 213	Public Policy Actions	A-71	Identify, quantify, and adjudicate all water rights and all wet water quantities.	Identify, quantify, and adjudicate all water rights and all wet water quantities in the water planning region.	Water Rights	Identify, quantify, and adjudicate all water rights and all wet water quantities in the water planning region.	Adjudication is the legal process of reviewing all water rights claims in an area to determine which are actually defensible. The process results in a clear accounting of how much water may be used and by whom. Currently, on average, there are more claims than there is water, so this process would clarify who must stop using water during a water shortage.
10 11 27	Data Collection	A-73	Integrate a regional Geographical Information System (GIS) database of publicly accessible information on water resources and photo imagery	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.	Implementation of Plan - Management	Establish and integrate a regional Geographical Information System (GIS) database of publicly accessible information on water resources and photo imagery covering the water planning region.	This would be a helpful tool for planning and modeling, provided the data is accurate.
271		A-143			Water Rights	Encourage active water resource management by the State Engineer (OSE/ ISC).	Currently the Office of the State Engineer (OSE/ISC) administers water rights and associated data. The role of the OSE/ISC should be expanded to be proactive in managing our overall water resource.
272		A-144			Water Rights	Address groundwater/ surface water interactions in the statutes for administering water rights	There is a connection between surface water and shallow ground water. That is, by extracting groundwater, surface water will percolate down to the shallow groundwater and "fill in" the volume of water that has been pumped. This interaction has a time lag and will not be immediately observable. For groundwater wells near the river, the effect may take days or weeks depending on the separation distance. For groundwater wells further away, the effect could take weeks or years. One example of the need for this accounting of the interaction of surface water and groundwater is that a junior water rights holder who has pumped groundwater, could later "infringe" on the water supply to senior surface rights holders, particularly during a time of drought.

273		A-145			Water Rights	Drought year agricultural forbearance	Compensate farmers who voluntarily reduce or eliminate irrigation diversions in dry years. US Bureau of Reclamation has a favorable report out on this alternative and the Alliance for Rio Grande Heritage is exploring the political aspects with stakeholders. If this concept could become a regular practice during drought years, the savings could protect the most vital uses, such as drinking water, ecological protection and perennial crops. Water rights need to be redefined so that the right will not be lost as the result of forbearance

			Technical Feasibility				
Original Number	Implementation urgent: needed for managing first drought	Candidate for Modeling	Initial Cost to Implement	Ongoing Cost for Operations and Maintenance	Potential Funding Sources	Implementation Time	Needed Enabling New Technologies and their Status
33 65 66 124 126 170 202		Yes	unknown/ billion Estimate $30-100 mil over 20 years/ Data available	cost of keeping restoration in effect	state or local gov't subsidy; Fed possible but unlikely	20-50 years	none
67 130			unknown/no research done on these species	results in cost savings	fed research; maybe initial incentives	unknown-same as G	need to look into activities in Cerro Grande response funding
58 159 267	Yes		low	data logging costs	Legislature or users, possibly federal sources	almost done/ongoing	none
72 97 232			$400 metersx15,000 wells + cost to read-annual recurring costs unknown	state legis. for OSE	decades	none	none
60 134 151 265			Huge	minimal	probably, feds are the only source of sufficient funds	unknown	Could be done currently with pipe/ concrete; cheaper tech. may be found
61 174			very high/per acre huge	Surface water drip requires ongoing filtration	state or local gov't subsidy; Fed possible but unlikely	unknown	none
59 64 136 158			low			depends on economic viability	
41 88			very high for dual piping; may be practical for utility-supplied bottled water	treatment of surface water just for non-drinking purposes; bottling distribution costs	utility rate payers	forever/ long time for dual system, less for bottling system	none
7 49 51 75 76 135 147 149 184 200 210 211 244 45	Yes		low	loss of water bill revenues	local general funds	immediate	none

150 177 190 191 246 187	Yes	Yes	low	low; enforcement; loss of water bill revenues	local for devices and enforcement; user costs		none
189 52 188		Yes	moderate	none	utility rate payers; or state/local taxes	ongoing	none
201 74	Yes		low-high	cost of incentives, estimated to be low	local gov'ts; with state and grant support	long-term for greywater/moderate for rain harvesting	none
209 79			variable depending/ generally high	similar to urban waste treatment	fed/state for retrofit; impact fee or local taxes for new devils	ongoing-long	none
83 84 183			high	moderate	Recycler pays (industry or gov't)	ongoing	none; cost needs to come down
70 71 178 245 163			highly variable			ongoing	
8 16 15 68			0-low	low	local agencies	ongoing	none
20 21 207 231 38		Yes	medium high			10-50 yrs	
77 180 39 143 144 179 148 152 91			wide range			ongoing	
173 196 253			medium	keeping of proper plantlife through storms and aging	fed/state	ongoing	none
259		Yes	medium	data gathering and monitoring	OSE, state, fed agencies	long	improved river and weather modeling is likely needed

22			medium high	facility ops and disposal of effluent concentrates	feds, state, or business incentives	short	cost reductions in process are wanted
23			high			ongoing	
44 261 48			high	same as initial cost	federal	decades	technology is the result; none needed to do the research
18			low	none	individuals or local gov't subsidy	medium	none
29 30 43 182 243 247 263 37	Yes		high	minor	federal, state	long	None
90 81			high	high	local gov'ts	medium	matching qualities of water and clogging of systems
82 87 95			variable	for data gathering and analysis	state legis fed grants	ongoing	none
226			low	$150K per year (two people)	State, Local Gov'ts or CoG	ongoing	none
176			unknown	none	none	long	none
197 206 215 217 219 220 240 55		Yes	medium	administrative costs	Gov'ts - state and local	Ongoing	none
111 112 113 114 116 146 203 117			medium	variable; depends on intensity of program	grants, federal, state, or local	ongoing	none
198 241 98	Yes		variable	low	private, state, federal	ongoing	None
264			low	variable depending upon intensity of program; minimum of $200K	ISC	ongoing	permits exploration of new technologies
132			low	negative costs to gov't	water users	short, once it is approved	none

96			variable, may be strung out over time	minimal to negligible	COE, BOR NRCS	ongoing	none
192			meter cost for existing wells	some enforcement and monitoring	well owner (new) and government (existing wells); legislature for enforcement	short, once it is approved	none
157 133			low	none	not needed	immediate once approved	none
3 2			highly variable, possibly huge	highly variable, possibly huge	Federal, State and Local Gov't	medium	none
103 104 212 12 13 266 269 24	Yes		medium	new or expanded bureaucracy	taxpayers	short, once approved	none
250 251 252 254 256 262 236			high	fees and pumping for imports	users	long for imports from other basins	none
46 101 107 268 213			high	low	State	long	none
10 11 27			moderate	moderate	State or new regional/local water authority	ongoing	track evolving technologies
271			medium to high	medium	state legislature	immediate	none
272			highly variable with many unknowns	moderate; but personnel intensive; litigation costs unknown	state legislature	immediate	none

Physical, Hydrological, Environmental Feasibility										
Infrastructure Development Requirements	Effect on Water Demand	Effect on Water Supply (surface and ground)	Water Saved/Lost (consumptions and depletions)	Impacts to Water Quality (and mitigations)	Impact to Ecosystems	Implications for Endangered Species	Watershed/ geologic Impacts	Public Health Effects	Other Considerations	Original Number
none	non native species removal reduces riparian demand (20%?)	none	0-2ac-ft/acr/yr 30 - 40,000 acres	none	modifies to status of some years ago	fly catcher is starting to use non native species for habitat	none	none	Requires federal $$$/ where does the water saved go? Credits for savings ? Bosque clean up impact fees.	33 65 66 124 126 170 202
probably need roads, other support	non native species removal reduces riparian demand (20%?)	none	included in A-1 - unknown	none	modifies to status of some years ago	fly catcher is starting to use non native species for habitat	none	none	It's a finite resource	67 130
massive changes in irrigation construction	reduces demand	none	could lead to savings	none	none	none	none	none		58 159 267
should reduce; should aid in under-standing of demand	none	could lead to savings	none	none	none	none	none	difficult politically	helps meter sellers, one time	72 97 232
none, beyond the ditch mods	reduces riparian demand	reduces recharge to shallow aquifer	gain water	none	reduces or removes riparian habitat	no effect on minnow; may reduce flycatcher habitat in some areas	none	none		60 134 151 265
none	reduction	drip may reduce shallow aquifer recharge	saved	none	none	none	none	none	huge in MRG valley no difference (NMSU) may depend on crops/change crops from alfalfa	61 174
			Saved						dependent on markets	59 64 136 158
piping or bottling distribution systems	none	none	none	preserves quality for needed purposes; avoids use of quality water where not needed	none, unless surface water use is also increased	none	none	avoids quality change in drinking water due to SJ/C or surface conversion	maybe save from pumping from aquifer/source of water changes, alternative delivery system	41 88
low flow device issues	reduces	not applicable	could be relatively significant savings	none	Less water for the minnow because of less pumping	less water for minnow	less drain to aquifer, defers subsidence	none		7 49 51 75 76 135 147 149 184 200 210 211 244 45

cost of devices, domestic well meters, time of day metering/log ging	reduces	none		none	none	none	preserves aquifer	none		150 177 190 191 246 187
none	reduces	slows aquifer draw	saves water	none	reduces return flow to river	minor	none	none	may reduce withdrawals	189 52 188
grey water requires separate on-site plumbing	some reduction	reduces aquifer impact	saves water	none	effect of household chemicals	none	none	none, if done correctly	have to change plumbing system for greywater/rain harvesting no system change/part of landscaping/rain harvesting can work here	201 74
retrofit systems, piping	none	may increase return flows to river	none/	Prevents pollution of aquifer	none	see "Effect on Water Supply"	see "Impacts to Water Quality"	see "Impacts to Water Quality"	water quality issue	209 79
extensive	reduces withdrawals or diversions, no effect on depletion	reduces groundwater return flows to river; would divert less from river	none for consumption and depletion	leaves higher quality water in aquifer	good for surface water sources; bad for groundwater sources	good for surface water sources; bad for groundwater sources	reduces depletion of aquifer	none	done now, we don't treat wastewater for drinking water, reuse water instead of putting in the river	83 84 183
			savings						savings because landscaping/requires complex regulatory changes/lot sizes getting smaller	70 71 178 245 163
none	intended to reduce demand, might actually increase	none	unknown	should improve quality	some help	unknown	none	none	ongoing but complex regulatory changes	8 16 15 68
			possible gain to ground water						maintenance and sediment high annual recurring costs research required possible Compact impact	20 21 207 231 38
			possible gain to ground water						county municipal could require legal authority and increased funding - possible Compact impact	77 180 39 143 144 179 148 152 91
wetlands and the storm distrib. systems	increase in ET	increases shallow aquifer recharge	possible gain to ground water	improves quality of treated effluent	helps	improves habitat	none	none	Clean water act State Engr issues	173 196 253
upstream and other sensors; data gathering systems	none	improve by better river and lake management	some savings	none	may change hydro- graph	need to watch hydro-graph impacts	none	none	infrequent occurrence - possible large volumes of water	259

treatment and import systems	none	increase	potential gain	risk from effluent	see "Impacts to Water Quality"	none	none	none	high tech solution - energy consumptive handling of saline discharge	22
			potential gain						ESA - who credited w/ savings	23
none	none	increase	maybe	depends upon technology	see "Impacts to Water Quality"	see "Impacts to Water Quality"	see "Impacts to Water Quality"	see "Impacts to Water Quality"	political legal technical issues	44 261 48
none	enhanced water consciousness, reduced demand	increase	some savings	none	none	none	none	none	evaporation effects - capture system	18
possible dam needs; may be able to use existing dams	none	very large increase is possible	saved	minor	river flows will be altered	dependent upon new river flow operations		none	Compact issues, build new dams, change shorelines every other issue	29 30 43 182 243 247 263 37
extensive	none	allows river water storage	some savings by reduced evaporation	none	may affect hydrograph	may affect hydrograph	affects subsidence, geochemistry	none	Water must be compatible with aquifer - evaporation loss - who gets the savings	90 81
sensor systems, data reporting	none	avoids reduction	none	preserves quality	none	none	none	avoids damage	none	82 87 95
none	none	may affect location of new wells	none	prevents degradation of quality	none	none	none	helps protect via better water quality	Needs to be State mandated	226
none	none	may reduce delivery requirements	maybe	none	may increase instream flows	may increase instream flows	none	none	Requires amendment of Compact	176
none	major reductions	none	potential gain	none	less pressure to modify ecosystems	less pressure to modify ecosystems	none	indirect	big legal and political implications	197 206 215 217 219 220 240 55
need to build lines of communication	reduces	none	potential gain	indirect	indirect	indirect	none	none	none	111 112 113 114 116 146 203 117
none	moderate reduction	preserves aquifer content	potential gain	negligible	negligible	none	none	none	none	198 241 98
initial regional water plan	potential reduction	enables search for new supply	potential gain	may have long term protective effects	may have long term protective effects	may have long term protective effects	may have long term protective effects	may have long term protective effects		264
metering	should reduce	none	high potential saving	none	indirect benefit	indirect benefit	none	none	Difficult political and legally	132

lining of ditches, laser leveling, crop selections	reduce infiltration losses and ET	none	potential gain	possible reduction in surface water salinity metals	impacts to ditch riparian environment	in stream plus for minnow - potential loss of habitat for flycatcher	loss of recharge windows	none	aesthetics of ditch banks	96
meters and monitoring	should reduce	none	some saved depending on enforcement	none	none	none	reduced groundwater use	none	Requires changes to future laws	192
none	legalizes existing demand and permits additional demand	none	increased depletion if new demand materializes	none	substantial health improvements	substantial health improvements	none	none	Preserves integrity of rivers	157 133
none	none	could increase	potential gain	Could improve	should improve	dependent upon plan	should improve	none		3 2
none	not per se	none	potential gain	none	Less water for the minnow because of less pumping	less water for minnow	less drain to aquifer, defers subsidence	none	Difficult legally, politically	103 104 212 12 13 266 269 24
pumping and piping for imports from other basins	none	increases	gain water	depends upon source	helps at destination, may hurt at source	helps at destination, may hurt at source	none	none	difficult legal environmental socia	250 251 252 254 256 262 236
none	none	none	none - allocation	none	none per se	none per se	none	none		46 101 107 268 213
GIS software	none per se	none per se	potential savings	none per se	none per se	none per se	none per se	none per se	Requires ground truthing and technology development	10 11 27
none	none	could be significant	potential savings / potential reduction in depletions	none	could be significant	unknown	potentially significant watershed impacts	none	none	271
none	none	none	none (this is an improved accounting technique)	none	none	unknown	none	none	none	272

	Economic Impacts		Social and Cultural Impacts			Political Impact				Characteristics of Legal Implications, Issues and Solutions				
Original Number	Effect Upon Economic Sectors	Changes to Local/Regional Business	Social Issues and Impacts	Impact upon Preservation of Traditional Values	Equity/Justice Issues	Local Support (nature/rationale)	Local Opposition (nature/rationale)	Interagency Conflicts Needing Resolution	Means of Implementation	Federal	Interstate (Compact)	Tribal	State and State-Authorized Entities	Local
33 65 66 124 126 170 202	helps tourism	none	improves recreation	none	none	strong	concern for who pays	need to decide who manages and executes program: feds, locals, MRGCD?	paid program; federal subsidy - par of fire management funding?	none	should help on deliveries; no issues	already doing	see "inter-agency conflicts"	see "inter-agency conflicts"
67 130	helps tourism	creates a new business area	improves recreation	none	none	likely	none	none	paid program; federal subsidy - par of fire management funding?	none	none	none	none	none
58 159 267	meter sellers gain; farmers who have to pay for meters lose	none	while not a taking, it is perceived as such	while not a taking, it is perceived as such; will help preserve farms	improves equity by matching rules on urban users	minimal	extreme; fear of my getting less water; seen to be tied to water rights	who pays issue; who monitors; who controls	legislative	none	none	none	who pays issue; who monitors; who controls	who pays issue; who monitors; who controls
72 97 232	none	none	none	none	by those impacted by new domestics	seen as a "big brother" issue; concern by 3 afpy abusers	none	OSE regulation	none	none	should help on deliveries; no issues	none	none	
60 134 151 265	reduces ditchbank recreation facilities	helps construction industry during installation	none	reduces ditch greenbelt	none	urban concern for agricult. Inefficiency	recreator and species opposition likely	question of who pays	state legislation or Conserve. District edict	none, other than source of possible grant funds	none	none, except for ditches on tribal land	need funds	none
61 174	none	helps leveling and drip business	none	none	none	generally positive	concern for costs being imposed on individual farmer	none, other than who pays	subsidy or incentives	none	should help on deliveries; no issues	none	none	none
59 64 136 158														
41 88	none	creates local mass bottling supply business; may hurt import bottling business	affects the way people are used to getting drinking water	none	none	probably needs to be developed	fear of change; effect upon current bottlers	none	each utility or local ordinance; or regional authority	none	none	none	none, unless done on regional basis	need ordinances and probably some incentives
7 49 51 75 76 135 147 149 184 200 210 211 244 45	none	none	none	some impact	possible impact to low income people who already use small amounts of water	not a problem	none	city vs county, and agencies within city; jurisdictional and enforcement issues	elected bodies	ESA Issues	should help on deliveries; no issues	none	compacts	need to implement ordinances

150 177 190 191 246 187	negligible	negligible	depends upon how costs are distributed		possible impact to low income people who already use small amounts of water; depends upon how pricing is distributed	some	a lot to any price increases; controls are not popular	city vs county, state PRICE	ordinances	none	should help on deliveries; no issues	none	PRICE for regulated utilities	ordinances needed
189 52 188	none	helps device suppliers	none	none	none	mild	concern for who pays	none	utilities or local ordinances	none	none	none	none	need to establish ordinances
201 74	negligible	negligible	raises water awareness	none	none	some	minor	need to establish incentive manager	local ordinances	none	should help on deliveries; no issues	none	state law change needed	need to establish equitable program and funding
209 79	none	Helps wastewater supplier business	none	none	none	mild; likely to grow	concern for costs, who pays	none	local ordinance	none	none	none	none	need ordinance
83 84 183	Recycler pays	none	none	none	none	in principle	costs may be too high	incentives to recycle given water quality issues	decide to allocate funds	EPA return flow quality standards	should help on deliveries; no issues	Tribal return flow quality standards	State return flow quality standards	must implement
70 71 178 245 163											should help on deliveries; no issues			
8 16 15 68	could aid or could hinder development	none	none	none	none	some	none	potential conflict between state and local agencies	state statute and local ordinance	none	none	none	need change to state law	need local ordinance
20 21 207 231 38														
77 180 39 143 144 179 148 152 91														
173 196 253	helps tourism by increased recreation	helps plant supplier business	improves recreation	none	none	mild, likely to increase	concern for costs	who pays issue; who monitors; who controls	probably a fed program	none	none	none	probably need enabling legisl.	issue of how land is acquired
259	none	creates monitoring business	none	none	none	none; likely to grow	none	need to coordinate resultant river manage meant	multi-agency agreements	none	trades on "spill" clause of compact	none	ISC likely needs to be lead	none

22	none	potential utility business	none	none	none	mild	possible concern from water exporters	none	local utility process	none; need to avoid crossing CWA	none	none	import issues and regional authority issues	utility issues
23														
44 261 48	none	slight help for research institutes	none	none	none	mild	none	who does research; who pays	grants, federal budgets	none	none	none	none	none
18	none	helps plumbing suppliers	none	none	none	mild	none	none	local ordinance	none	none	none	none	none
29 30 43 182 243 247 263 37	change to recreational use; real estate values	little within region; effects are outside of region	none	some upstream areas may get flooded	none	yes, within region	intense, at both new and old storage locations; concern for flooding, loss of recreational trade	needs extensive coordination among river users and operators		needs revised river operations; needs revised reservoir use permissions	needs agreement among compact states; must design win-win-win approach	depends upon selected storage sites	needs revised river operations	issues at old and new storage sites
90 81	none	helps engineering companies	none	none	none	pockets of support	concerns for costs	none	local gov't decision	none	one of the few kinds of allowed storage	none	none	none
82 87 95	none	some extra work for well drillers, data gatherers	none	none	helps those who live on shallow wells	mild	none	Relative roles of NMED /OSE, state/ local decision	state directive; maybe local	none	none	may be the driving force for this	need legis funding	none
226	none	may have "zoning" effect on some business	none	none	none	neutral	neutral	who is in charge	state regulation	none	none	none	Depends on who is to be lead	Depends on who is to be lead
176	none	none	none	none	none	should be strong	unlikely	none	compact change	may help meet ESA	big	none	none	none
197 206 215 217 219 220 240 55	adverse to building trades, positive to service trades	large, details depend on methods of implementation	effects on number and kinds of jobs	may help preserve values	none	very strong and broad from public	strong from development trades	may shift center of authority	regulatory	none	helps meet delivery requirements	none	need enabling legislation	need local ordinances
111 112 113 114 116 146 203 117	none	helps public relations firms	promotes informed public	indirect	none	general public support	concern for slanted info; concern for costs	none	state, local and volunteer efforts	none	none	none	requires funding	requires funding
198 241 98	none	none	raises water awareness	none	none	yes	none	none	public outreach, educational institutions	none	none	none	none	none
264	none	none	none	indirect	none	mild	concern for costs	none	ISC directive and appropriation	none	helps understand evolving compact issues	helps deal with the eventual adjudication	none	none
132	depends on who gets exempted	helps meter sellers	depends on who gets exempted	indirect	depends on who gets exempted	mild	concern for taxation	who controls the collected trust funds	state law	none	should save water	none	state law needed	none

96	no effect for external funding	positive to irrigation support businesses	aesthetics/riparian	increases viability of acequias	none other besides those mentioned	mild	Additional taxes	none	appropriation of funds	Potential ESA issue	should save water	none	none	none
192	minimal	increased meter sales	none	none	none	strong for cumulative effects and preventing cheating	strong opposition to regulation	none	state law	already mandated in Gila	positive for deliveries	none	change in state law needed	none unless delegated by State
157 133	Reallocation effects	Reallocation effects	none other than noted	none	perceived as negative by acequias	Strong for environmental reasons	Opposed by acequias	none	change in state law or administrative practice	ESA may establish in-stream flow rights in critical habitat	possible adverse to deliveries	none	change in state law or administrative practice	none
3 2	could restrict range and forestry practices	needs economic value for small diameter wood	none	none	none	broad public support	some environmental opposition	none	agency action	much is in national forests	may help deliveries	some is on tribal land	mission of SWCDs	none
103 104 212 12 13 266 269 24	none	none	none	some impact	possible impact to low income people who already use small amounts of water	not a problem	none	city vs county, and agencies within city; jurisdictional and enforcement issues	elected bodies	ESA Issues	less water in river	none	compacts	need to implement ordinances
250 251 252 254 256 262 236	helps at destination, may hurt at source	none	basin of origin issues	basin of origin issues	basin of origin issues	strong at destination	strong at source	none	market for intra-basin, statutory for inter-basin	ESA issues at source	depends on source	case by case	statutory and administrative limitations	none
46 101 107 268 213	Junior rights holders lose; market functioning improves	none	the process can create social conflict	legal representation required	Tribal and acequias concerns	Broad support to quiet title	Concern about inequitable outcome	Pervasive	Litigation or negotiation	ESA, tribal trust and Reclamation responsibilities	none	Myriad issues	Extent of MRGCD rights; OSE initiates	All rights holders are involved
10 11 27	none	none	none	none	Equal access must be provided	Favorable	Costs concerns	Jurisdiction	Appropriation	none	none	none	none	none
271	could be significant	potentially significant	unknowns	unknown	unknown	substantial	none	many	state legislation	increased	increased	unknown	OSE + others	all levels of government
272	unknown but potentially significant	unknown but potentially significant	unknown	unknown	significant	substantial	could be significant	potential	legislature	potential	potential	unknown	potential	potential