UTTON TRANSBOUNDARY RESOURCES CENTER

Water Matters!

Volume 2015 Article 11

1-1-2013

Groundwater

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"Groundwater is a very small percentage of the Earth's water."

EPA, *Water Cycle and Water Conservation,* **www.epa.gov/regional/students/pdfs/gndw_712.pdf**

Groundwater

Since the late nineteenth century, New Mexicans have been developing the state's groundwater resources. From hand-dug wells to proposed wells that could penetrate to 12,000 feet, residents have sought sources to supplement and replace surface water. The state relies upon groundwater to supply almost 50 percent of its needs.

The 1885–1904 drought led to early groundwater development in the Roswell Artesian Basin area in eastern New Mexico and in the southwestern part of the state. Residents of the Roswell and Artesia areas drilled their first wells in 1891 and constructed the first large municipal well in 1903. A few years later, agricultural development took off, creating a successful economy based on groundwater. Extensive shallow groundwater development took place in the 1930s and withdrawals on average exceeded the projected average natural recharge by 80 percent in the 1950s.

In the Gila River and Mimbres River basins, available surface water and rainfall were not sufficiently reliable for the growing agricultural pursuits. Groundwater pumping supplemented the other available resources.

In 1931, the New Mexico legislature passed the state's Groundwater Code in response to groundwater pumping in the Roswell area. The code gave the State Engineer administrative control over groundwater pumping after the Engineer "declared" a groundwater basin; that is, identified a groundwater source of supply with "reasonably ascertainable boundaries." In the eighty years since the passage of the Groundwater Code, the State Engineer has declared basins, when in his judgment, the declaration was necessary to allow for the protection of senior water rights in the area. By 2006, all groundwater basins in the state had been declared.

The drought of the 1940s and 1950s intensified interest in groundwater pumping as surface water supplies and precipitation dwindled. The

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introduction of new technologies and population growth caused New Mexico groundwater development to explode after World War II.

Pumping has caused many New Mexico water tables to drop. A declining aquifer can affect surface supply if surface water drains into it to fill the void. This situation reduces the amount of surface water available for surface water rights, which are often senior to groundwater rights.

In City of Albuquerque v. Reynolds, the New Mexico Supreme Court affirmed that the New Mexico State Engineer has the authority to recognize the connection between surface and groundwater in his/her administration of water. Thus connected surface and groundwater must be considered together in any analysis of water rights.

As of 2009, New Mexico used about 1.9 million acre-feet of groundwater each year for agricultural, municipal, and other purposes. According to the National Groundwater Association, groundwater supplies 47 percent of the water used in New Mexico. The Association reported the annual usage in 2011 as follows:

Purpose	MGD	% total GW	% total supply for purpose
Public Supply	249	15%	87%
Household (self supplied)	32	02%	100%
Irrigation	1,270	76%	45%
Livestock/ Aquaculture	49	03%	70%
Industrial (self supplied)	12	01%	87%
Mining	57	03%	98%
Thermoelectric	10	01%	19%

As the population grows and drought intensifies, groundwater sources are tapped with increasing urgency. Limited steps are being taken to preserve groundwater through conservation, groundwater recharge, and regulation.

Groundwater Basins of New Mexico

There are thirty-nine groundwater basins in New Mexico. Some are isolated or closed basins and some are hydrologically connected to surface water. An isolated or closed basin, encased by surrounding geology, does not receive significant recharge from surface water or precipitation.

Groundwater withdrawal that exceeds a basin's recharge is known as "mining," "dewatering," or "overdrafting." Examples of mined aquifers in New Mexico include the Ogallala Aquifer of eastern New Mexico and the Great Plains; the Jornada del Muerto and Hueco Basins of southern New Mexico; the Estancia Basin east of Albuquerque; and the Sandia Mountains. Some basins are not well connected to surface water sources and recover from pumping slowly. Other basins, such as the Albuquerque Basin are well connected to surface water and receive recharge from stream flows.

Underlying many declared groundwater basins are undefined deep water basins or aquifers. Toward the end of the twentieth century, attention turned to this groundwater as a possible source for meeting New Mexico's increasing demand. The nature of deep groundwater is not well understood, but it is less dependent upon surface water than shallow groundwater basins for recharge. It is not accessed frequently because of the expense of deep drilling and uncertainty about its quality.

Regulatory Institutional Structures

State, federal, and tribal governments each manage some aspects of groundwater. The federal government has long deferred to state law in this arena; however, there are exceptions where the federal government has a management or regulatory role. Some tribes have developed and adopted tribal water codes which include provisions regarding groundwater management.

State Institutions: The public owns all water, including groundwater, in New Mexico, with the right to use water established by state law. The New Mexico Office of the State Engineer (OSE) administers the state's water resources through the supervision, measurement, appropriation, and distribution of all surface and groundwater in the state. Under the 1931 Groundwater Code, the State Engineer gains jurisdiction over groundwater by delineating or "declaring" groundwater basins. The Engineer creates water districts and appoints water masters to help actively manage both ground and surface water, to assist with compliance issues, and to administer water distribution on a daily basis.

Rules, Regulations, and Guidelines: The statutes provide the State Engineer with the authority to develop rules and regulations to carry out the purposes of the New Mexico water codes. The Engineer has adopted general groundwater regulations that address:

- Rights that were developed prior to the declaration of a basin;
- Well permitting processes;
- Licensing of uses;
- Construction of wells;
- Changes to location, place, or purpose of use;
- Changes of ownership;
- Supplemental, deepened and repaired wells;
- Well plugging;
- Termination of water use;
- Metering and reporting requirements; and
- Transport/storage of water.

Appropriations, Declarations, Permits, and Licenses: State Engineer documents that describe appropriations include declarations, permits, licenses, or some combination of the three. These provide the State Engineer with administrative information about groundwater uses. Prior to the State Engineer's declaration of a groundwater basin, an appropriator was not required to document or to request permission to develop a new groundwater use.

Once a basin is declared, all new groundwater appropriations, alterations to existing uses, and drilling of supplemental or replacement wells must have a permit from the State Engineer. Notice is made and anyone objecting to the proposed action may file an objection with the OSE. An objection must include discussion of substantial and specific impairment to the objector's existing rights or proof that granting the permit would be contrary to the public welfare and/or the conservation of water.

The OSE's Administrative Hearing Unit (ALU) hears challenges, takes evidence, and renders decisions. The hearing examiner submits a report and recommendations to the State Engineer for disposition. The decisions may be appealed to the district court in the county where the diversion is located. Once a well is drilled and water is put to beneficial use, the regulations provide that an applicant shall prepare and file a final inspection and report prepared by a registered survey professional. When that step is completed, the State Engineer will issue a "Certificate and License to Appropriate." A limited number of licenses have been issued throughout the state.

There are 39 underground water basins in New Mexico. Some of these are isolated or closed basins and some are hydrologically connected to surface water.

The Engineer declares basins in response to increased well development, aquifer drawdowns, and impacts on surface-water that put existing interstate and intrastate obligations and uses at risk.

Mined Groundwater Basins: The process for permitting or licensing new or changed uses is generally the same for all groundwater appropriations. The State Engineer may develop administrative guidelines for issuing permits for new appropriations and changes to uses in mined groundwater basins. The goal of administering groundwater basins is to extend their productive life by regulating the rate of dewatering. The Engineer develops regulations or guidelines after determining that a basin has been fully appropriated. This determination is captured in an order which closes the basin to new water use permits for an indefinite period.

The State Engineer considers developing guidelines when a groundwater basin shows signs of significant stress. Problems that have led to guidelines include: domestic wells going dry and irrigation wells experiencing reduced production in the Curry County-Portales Basin; declining water levels and deteriorating water quality in the Estancia and Tularosa Basins; and, groundwater depletion effects on the Rio Grande from Albuquerque's municipal pumping on senior users, Compact obligations, and land subsidence. These conditions signaled a need for more careful and restrictive administration.

The goal of the guidelines is to guide OSE staff in the administration of the groundwater to 1) assure the orderly development of the water resources within the basin; 2) meet the statutory obligations regarding protection of the senior users; and, 3) extend the life of these basins so that they have a minimum of forty years of productivity.

The State Engineer can also declare a Critical Management Area (CMA) within a mined basin. A CMA defines an area where water level decline rates require additional protection for the basin. It generally includes any area where there is insufficient groundwater to sustain existing appropriations for a forty-year period. In a CMA, drawdown restrictions are more stringent to maximize the useful life of the designated area.

Pumping Depletions on Surface Water: The State Engineer can condition any new groundwater permit by requiring "offsets" where pumping will cause unacceptable depletions of surface water resources. To meet an offset requirement, a proposed appropriator must acquire a senior surface water right and obtain an OSE permit to transfer it, that is, change the place of use, to the proposed groundwater diversion. The land on which the surface water was used no longer has an appurtenant water right and the right to use water on it is said to be "retired."

Requiring offsets protects the surface flows of the related stream by reducing surface water diversions from a river to accommodate depletion or reduction by pumping. This strategy is a critical part of conjunctive management of surface and groundwater resources.

Domestic and Other Small Uses: The State Engineer's authority over relatively small groundwater withdrawals for domestic, livestock, and temporary purposes is somewhat limited. NMSA 1978, § 72-12-1 and its subparts require applicants to apply for and the State Engineer to issue these permits. The Engineer generally does so without evaluation, public notice, or hearing.

The State Engineer published domestic well regulations in 2006 and amended them in 2011. The State Engineer may declare a Domestic Well Management Area (DWMA) or CMA to protect valid, existing water rights and mined aquifers from the effects of domestic wells. The subsequent guidelines may include more restrictive limits on the amount allowed per domestic use.

Metering: To further the mission of protecting and administering New Mexico's groundwater diversions, the OSE now requires metering, monitoring, and reporting water usage in certain areas. Previously, metering was not required unless by a court order. Metering and reporting allows the State Engineer water masters to monitor for over-diversion and to manage the condition of the aquifer.

The State Engineer requires metering in areas of the Roswell Underground Water Basin, Carlsbad Underground Water Basin, and Capitan Underground Water Basin. The Engineer ordered metering of all groundwater diversions in the Lower Rio Grande Water Master District, except those for domestic or livestock purposes. He signaled that he may order metering of these exceptions at a later date. The Engineer requires affected well owners to obtain, install, maintain, and repair any meter and to report meter readings to the OSE on a biannual or quarterly basis, or more frequently if necessary.

Deep Groundwater Basins: The State Engineer's authority over deep groundwater basins is also limited. In 1967, the legislature passed the original deep groundwater statutes. This action was taken to protect oil and gas interests from involvement in Pecos Compact administration. Between then and 2009 when the legislature amended NMSA 1978, § 72-12-25, the State Engineer did not have authority to administer water from deep groundwater basins. The law only required simple notice for the drilling of a legal well. Under the current statute, the Engineer may obtain regulatory authority over non-potable deep groundwater for any use except oil and gas exploration and production, prospecting, mining, road construction, agriculture, generation of electricity, use in industrial processes, or geothermal use. Effectively, the Engineer's authority is limited to uses for municipal purposes. To obtain authority to regulate this water in the same manner as other groundwater, the State Engineer must declare a deep groundwater basin.

In a presentation in 2009, then State Engineer, John D'Antonio, stated if a deep aquifer was hydrologically connected to a shallow aquifer, there was no need to declare the deep basin. He outlined the next steps for the OSE to pursue:

1. Declaring non-potable deep water aquifers if technically defensible;
2. Determining the legal significance of the Notices of Intent filed and published prior to 2009;
3. Formalizing procedures for filing applications to appropriate water from deep aquifers;
4. Formalizing procedures to manage drilling of and reporting of usage from deep wells;
5. Setting a well-defined process to facilitate development of deep non-potable resources while protecting water rights and compacts; and
6. Recognizing that the economics of development will limit the use of deep aquifer water in the near term.

Today, OSE administrative procedures require interested parties to submit a notice of intent and to file an exploratory well permit application and proof of publication in the newspaper. In order to avoid the OSE permitting requirements, the owner must show the two conditions set out in the statute are met: the depth to water and the non-potable nature of the water.

The Interstate Stream Commission (ISC) protects New Mexico's right to water identified in eight interstate compacts, ensures that the state meets its obligations to its sister states, and makes certain that endangered species are afforded the necessary water. The ISC becomes involved in groundwater management where pumping affects surface water deliveries required under compacts and

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The State Engineer can also declare a Critical Management Area within a mined basin. A CMA defines an area where excessive water level decline rates require additional protection.

by endangered species. The ISC develops groundwater models to assist in the prediction of groundwater impacts on the rivers in its management of compact obligations. The legislature authorized the ISC to purchase water rights or appropriate water on behalf of any region. Under this authority, the ISC purchases and leases groundwater to supplement Pecos River flows so New Mexico can meet its obligations to Texas under the Pecos Compact.

Federal Management of Water: The federal government generally defers to state law for the management of water. In *California Oregon Power Co. v. Beaver Portland Cement Co.,* the United States Supreme Court addressed the question of federal involvement in water regulation in the western states. It recognized that water use "generally was fixed and regulated by local rules and customs." This approach included the doctrine of prior appropriation and was formalized in the Mining Act of 1866, the Desert Lands Act of 1877, and their subsequent amendments. The Supreme Court held that:

> …[F]ollowing the act of 1877, if not before, all nonnavigable waters then a part of the public domain became *publici juris,* subject to the plenary control of the designated states, including those since created out of the territories named, with the right in each to determine for itself to what extent the rule of appropriation or the common law rule in respect of riparian rights should obtain.

The Court went on to observe in a footnote that "Congress, since the passage of the Desert Land Act, has repeatedly recognized the supremacy of state law in respect of the acquisition of water," citing the Reclamation Act of 1902.

However, the federal government is not without constitutional authority to regulate or influence groundwater management. In the *Sporhase v. Nebraska* case, the United States Supreme Court found that the Commerce Clause clearly gives Congress the "affirmative power… to implement its own policies concerning [groundwater] regulation…. Groundwater overdraft is a national problem and Congress has the power to deal with it on that scale."

The effect of groundwater pumping on surface water rights is playing out in New Mexico's Lower Rio Grande water rights state court adjudication. The United States sought to protect its surface water rights for the federal Rio Grande Project from depletions caused by groundwater pumping in the area. As a matter of both state and federal law, the United States asserted that the source of the water for the Project is "(1) all the surface water in the lower Rio Grande and (2) water in the ground hydrologically connected to surface-waters in the lower Rio Grande." The state and other responding parties countered that the United States' claim is unsupported by New Mexico state law. On August 16, 2012, the state adjudication court found that the Project right being adjudicated is limited to a surface right and ruled that the federal claim is beyond the scope of the adjudication.

Tribal Institutions: The water rights of Native Americans are generally identified and defined under federal law. In *Winters v. United States*, the United States Supreme Court held that when the federal government created reservations, it set aside both lands and water. These rights are known as federal reserved rights or *Winters* rights. This holding could be interpreted to mean that reservation tribes have a right to the water itself and certainly means that they have the right to the use of the water. While this issue has not been addressed head-on by a court or commentator, it certainly underlies questions of administration.

Most state and federal adjudication courts have held that tribes have *Winters* rights to groundwater as well as to surface-water. In New Mexico, many of the Native Americans are Pueblo peoples who have held their lands and waters long before the arrival of other Americans. In its 1985 opinion, the Aamodt federal district court concluded that the Pueblos' water rights under Spain and Mexico law still exist and could be satisfied from either surface water or hydrologically connected groundwater. Later in 2001, the *Aamodt* court examined the question of whether the Pueblos own groundwater. It held that the Pueblos do not own groundwater but rather developed rights to use it.

Development of a tribal water code is one avenue to groundwater administration within tribal boundaries. The Navajo Nation, for instance, asserts ownership of full equitable title to groundwater through the Navajo Nation Water Code. The Nation's situation is not representative. Only a few tribes regulate the allocation of their surface and groundwater. Under the Indian Reorganization Act of 1934, tribes must obtain approval of the secretary of the Department of Interior when enacting laws. Under pressure from western states, the U.S. Department of Interior stopped approving tribal water codes in 1975 until such time as it could promulgate appropriate rules for the use of water on tribal lands. To date, these rules have not been written.

Native American water settlements, however, have addressed administration in a variety of ways. Tribes may agree to submit to local state engineer administration. In the *Aamodt* Litigation Settlement Act of 2010, the Pueblos agreed to inform the local state engineer or non-Indian water users about aspects of their water management. In the Navajo proposed final decree arising out of the Northwestern New Mexico Rural Water Projects Act Settlement Act of 2009, the Nation agreed to seek New Mexico State Engineer approval of any lease of their rights for uses off of trust lands. Tribes may also agree to forbearance provisions or to administer through tribal water codes as set forth in the Crow Tribe Water Rights Settlement Act of 2010.

In a survey conducted by the Tribal Law Journal several New Mexico tribes indicated that they have water codes.

Key Principles of New Mexico Law Concerning Groundwater

In New Mexico, water belongs to the public, but individuals, public entities, and private entities may acquire a right to use water. State statutes identify the core elements of water rights, which include: priority, amount, purpose, periods, and place of use, and, as to irrigation water, the specific tracts of land to which it is appurtenant. These principles apply to both surface and groundwater.

Permits: By issuing a permit the State Engineer grants the applicant permission to drill a well and to develop water up to a certain amount. The permit is not proof of a water right in and of itself. The appropriator must diligently pursue development and application of water to beneficial use. The maximum amount allowed under a permit is governed by regulation and/or adjudication. Following development, the Engineer may issue a license upon inspection and proof of actual beneficial use. The hierarchy of formal recognition of a ground or surface water right has a declaration of water use at the bottom, rises through a permit to a license, and ends up with a decreed right from a court.

The decision of whether to issue a groundwater permit depends on the type of permit desired; whether unappropriated

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water is available; whether senior groundwater users will be impaired; whether additional depletions on fully appropriated streams will occur or interstate compact streams will be impaired; whether the use is contrary to the conservation of water in the State; and, whether granting the permit will be detrimental to public welfare.

The State Engineer determines impairment on a case-by-case basis. There is no statutory guidance except that the impairment must be substantial and specific to existing water rights. Lowering of a water level in a well, shortening of the useful life of a well, adding to lift costs, reducing the ability to produce, slight increases in salinity, and making it necessary to drill more wells to produce the same amount of water do not necessarily constitute impairment, but these factors provide some evidence of substantial impairment.

If the proposed water right will impair a hydrologically connected surface water right, the State Engineer will deny the application unless that effect is *de minimis*, the permit can be conditioned to avoid the impairment, or the effect can be offset. A groundwater applicant can offset pumping effects on the river by purchasing and retiring existing valid senior surface water rights.

There is little case law or statutory guidance regarding the tests of "contrary to the conservation of water within the state or detrimental to the public welfare of the state." These tests are also examined on a case-by-case basis and may be overcome by a showing of conservation practices or benefit to the public welfare. Recent municipal applications by Albuquerque and Alamogordo were supported by descriptions of present and future conservation successes and plans. One case, *State v. City of Las Vegas,* suggests that the detrimental public welfare test can be overcome where there is evidence of well development as a part of a municipality's forty-year plan to accommodate reasonable population growth. However, development of such wells could meet the test of "detrimental to the public welfare," if the proposed development threatens compact obligations, municipal water supply, or senior rights.

Priority and Priority Calls: The priority of a water right is related to the date on which the water either was put to beneficial use; the date of an application for a permit; or the date of some other indicia of intent to appropriate. The rules for determining a priority date of a groundwater right are the same as for a surface water right. Water associated with a supplemental well is an exception. In that case, the supplemental groundwater right priority relates back to that of the original water right.

Priority calls are the mechanism for managing water when there is a shortage. In that event, the State Engineer arrays the water rights in order of priority and administers deliveries water from the most senior down to the most junior. This system works fairly well for surface water users are involved. However in some cases, such as where senior surface users are downstream from junior groundwater users, the call against the junior users may not result in timely delivery to the seniors because of the time required for the effects to reach the stream.

A Carlsbad Irrigation District (CID) priority call illustrates the problem. The Carlsbad area was settled before the Roswell area, and so surface water rights in Carlsbad are senior to groundwater rights in the Roswell Basin. In order to gain control of illegal and excessive pumping in the Roswell Artesian Basin, the State Engineer initiated the *Lewis* adjudication of water uses in the Basin. In 1976, the CID placed a priority call with the

State Engineer. The Engineer contended that there would be devastating effect on local economies of shutting down groundwater uses in Roswell. It was also not clear that shutting down groundwater uses above the CID would get surface water to the CID farmers. State Engineer policy at the time also allowed administration only where rights were adjudicated. Since the CID's rights were not adjudicated, the Engineer expanded the *Lewis* adjudication to include the rest of the Pecos. As of 2012, the adjudication continues. Although the priority call never materialized, the 2003 Pecos Settlement provided some relief to District farmers through the purchase and retirement of water rights by the state and development of a pumping plan of groundwater from the Roswell artesian aquifer to augment downstream supplies for the farmers.

Domestic Rights: The priority of domestic right is the date on which the application for a permit was filed, if the well was drilled after the affected groundwater basin was declared. The date of a pre-basin well is the date when the well was drilled, dug, or the intent to do so was formed. The amount of a water right depends on the amount of water put to beneficial use, while staying within the permitted cap or maximum. Thus, prior to the 2006 regulations domestic water rights were limited to three acre-feet per year. This water was intended to serve a family's domestic uses, its livestock, and the irrigation of one acre of land for home food production. Today, the average domestic well serves only the household domestic needs and, by regulation in 2006, the State Engineer reduced the cap to one acre-foot per year. These uses cannot be transferred except under very limited circumstances set forth in the 2011 domestic well rule amendments.

Water Transfers: Under New Mexico law, water rights may be severed from the original place or purpose of use and moved to a new place or purpose of use. The State Engineer requires an owner wishing to make a transfer to apply for a permit to do so. As with any permit, the applicant must provide public notice, and if the application is protested, defend the application in a hearing before the OSE's Administrative Hearing Unit. When considering a groundwater right transfer, the State Engineer must consider the local effect of the new withdrawal.

Unresolved Questions

Several groundwater issues we face today include the effects of groundwater pumping on surface-water, groundwater recharge, and groundwater supplies for municipalities.

As groundwater is pumped, a cone of depression is created. A cone of depression is a dewatered area around a well shaft. Surrounding water flows along the cone toward the well shaft from every direction. Over time, the cone of depression expands, lowers the water table, and eventually reaches hydrologically connected surface-water. Where pumping lowers the water table, wells may be impaired or cease to function. Where there is a sufficient connection between surface water and an aquifer, surface water flows into the aquifer and toward the well, thus depleting the surface water resource.

Municipal Wells: In the Albuquerque area, ninety-two municipal wells supplied 19.6 billion gallons of drinking water in 2010. These wells have created cones of depression on both the east and the west sides of the Rio Grande. In 2004, the east side cone covered about 40 miles and in places lowered the water table about 150 feet. While the west side cone is smaller, similar effects were noted.

The effect of groundwater pumping on surface-water rights is playing out in New Mexico's Lower Rio Grande water rights state court adjudication. The United States recently sought to protect its surface-water rights for the federal Rio Grande Project from depletions caused by groundwater pumping in the area.

In New Mexico, water belongs to the public, but individuals, public entities, and private entities may acquire a right to use water.

The USGS developed a groundwater flow model that predicts the effects of Albuquerque's pumping if it continues at the same rate until 2060. The model predicts, even with conservation goals in place, significant aquifer drawdowns and land subsidence. Significant drawdown jeopardizes the city's ability to provide water to its residents into the future. While relatively little land subsidence has been observed in Albuquerque, as depletions continue, the city can look to Tucson's experience. Downtown Tucson has dropped six inches in the last twenty years due to aquifer depletion and suffered property damage and other problems as a result.

In an effort to forestall these problems, the Albuquerque Bernalillo County Water Utility (Utility) was formed and a Water Resources Management Strategy developed. The Strategy's goal is to reduce reliance on the aquifer, to reduce demand through conservation, and to switch to renewable resources.

To reduce reliance on groundwater, the San Juan-Chama Drinking Water Project, which replaces groundwater with treated contract surface water, and reclamation/reuse project, which use treated effluent for irrigated sites such as parks and golf courses, were developed. Through the utility's conservation program, city residents have reduced their use by 252 gallons per person per day in the mid-1990s to 150 gallons per day in 2011. The goal of the programs is to reduce annual pumping to 60,000 acre-feet a year in order to rest the aquifer so that it recovers through recharge. This strategy reserves groundwater for the future and for times of shortage. The strategy also calls for implementing an aquifer storage and recovery program whereby the utility stores water underground during the winter while demand is low for withdrawal in the summer when demand is high. This project is not designed to recharge the aquifer but rather to provide temporary underground storage.

The utility continues to use surface water as it is available but must rely on the groundwater more than originally anticipated. First, the transition to surface water was delayed, and then ash from the Los Conchas fire in the surface water resulted in excessive treatment costs that required reversion to groundwater for two months in 2010. Almost as soon as the San Juan-Chama Project was completed, drought conditions set in. As a result, the San Juan-Chama diversions were reduced by more than half in 2012. Surface flows in the river declined, as did the predicted natural recharge from runoff. In spite of these setbacks, the USGS reports that in several instances, groundwater levels have risen since the city began using surface water supplies.

Rural Wells Supply Growing Cities: Supplying water to municipal users underlies the controversy of the San Agustin Basin Project. In that project, a group of New York-based investors sought a permit from the State Engineer for the right to pump 54,000 acre-feet a year from a deep well field of thirty-seven wells in the San Agustin Plains near Datil, New Mexico. Augustin Plains Ranch, LLC plans to market water to municipalities and the state to help meet obligations under the Rio Grande Compact. The State Engineer denied the application because it was too vague. After losing its court appeals, the Ranch filed a second application. In this application the Ranch proposes to provide water to Rio Rancho and possibly other municipalities.

Groundwater for Agriculture: Agriculture is an intrinsically valued part of the economy of the area. Yet, in our arid climate, crop evapotranspiration rates are high. Under conditions of prolonged drought, available surface water is insufficient to meet the needs of the crops. The irrigators turn to groundwater to keep their crops and economies alive. As the groundwater is mined

and the surface water is depleted through recharge and drought, the obligations to Texas and Mexico under the Compact, to New Mexico and Texas farmers and ranchers in the Rio Grande Project, to the municipalities, and other users become difficult to meet. How to divide and manage the water between all competing interests and obligations during times of plenty and in times of drought is a difficult question.

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