

*Editor's Comment:* This is the first of a series of articles addressing issues associated with oil and gas development in San Miguel County. The articles are drawn from presentations submitted to the County Commissioners on January 10, 2013. They were written by participants in PROTECT San Miguel County, a local all-volunteer grass-roots organization. The group has been working with the County's Oil and Gas Task Force for three years, has toured several existing oil and gas producing facilities, and has been collecting extensive research on the issues. More information, including the full Commission presentations, is at <http://PROTECTsmc.org>.

*This Week's Author:* Bob Wessely has been dealing with water issues for more than 15 years. He is Chair of the City's Utility Advisory Committee and President of the Las Vegas Community Water Board and of the Middle Rio Grande Water Assembly.

## **Oil and Gas Development - Water Protection Issues**

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**Introduction** - San Miguel County is acutely aware that the water supply upon which its citizens depend is severely limited. This article identifies some of the issues involved in protecting that water supply.

**What water supplies are there?** Variable surface streams, originating from snowmelt, springs, and rainwater runoff, have been used for agricultural and domestic purposes for centuries.

Multiple formation layers of fresh groundwater have been deposited over the millennia, water that is pumped for domestic and agricultural uses. These layers ("aquifers") are very slowly refreshed by rainwater seepage.

Layers of older, usually deeper, brackish aquifers exist. We are approaching the point where this brackish water can be extracted, purified, and used for domestic and agricultural purposes at a financially competitive cost.

As the County's needs for domestic and agricultural water increase, as precipitation continues to shrink toward long term averages, as the County depletes its fresh water aquifers, and as technology improves, the deep brackish waters become increasingly important.

**What are the risks to these supplies?** There are two main categories of risk to our water sources – pollution of existing water sources, and adding pressure to existing water sources by granting new consumptive uses. The County will need to control both forms of risk.

A serious risk of pollution may come from oil and gas (O&G) wells. The risks are significant, both in likelihood of occurrence and in consequences of failure. A State of NM report shows 857 self-reported instances of groundwater contamination from O&G operations and facilities, for instance. Other research suggests approximately 2% of newer O&G wells fail (leak), with that number increasing as they age.

**What could pollute water supplies?** Possible avenues for O&G impacts to groundwater include:

- Improper well construction
- Abandoned wells
- Surface spills and leaks during operations
- Accidents during transport or storage
- Improper wastewater management and disposal.

Drillers mud, a water-based drill bit lubricant that can be toxic, is used to drill a well. Then, once a well is drilled, a common extraction method is to inject high pressure water containing chemicals, some of which are toxic (“fracking”). Other extraction methods use subsurface explosives or injection of concentrated acids. 40-70% of the injected fluids remain in the ground, while the remainder are recovered and stored above ground.

Besides oil and gas, there are other naturally-occurring compounds, some radioactive, found in the deep formations. The process of releasing and extracting oil or gas brings these other substances to the surface.

**What are the protection and monitoring strategies?** To protect water supplies from damages, the overall goal is to reliably keep the hazardous substances sealed up and out of streams, out of fresh aquifers, and out of brackish aquifers.

The industry stores hazardous fluids above ground in tanks or open pits. Leaks above and below the ground surface can migrate into aquifers. To ensure that substances remain where they belong, close monitoring of all containment and transportation facilities is needed, so that any leaks are promptly detected and remediated.

Drilling leaves a jagged-edged surface in the hole. Pipes are dropped into the hole. Unless proper steps are taken to encase the hole, gasses and liquids will migrate upward between the pipe and the jagged surface, and then flow into any aquifers that have been penetrated. Especially risky is the seal between cement and the jagged aquifers’ surfaces. Inspection and monitoring should be established to ensure the cement seals in fact do keep fluids out of all of the intervening aquifers, both fresh and brackish.

There is a further risk that horizontal drill bores will intersect natural fractures in the ground layers, fractures that could serve as a conduit up to aquifers or to the surface.

Technical mechanisms exist to define water monitoring methods. Some examples of targets for monitoring include alpha and beta radiation, methane/ethane, oil/grease, acidity, and selected volatile organic compounds (VOCs). Baseline measurements, conducted before drilling begins, are necessary so as to understand whether or not detected impurities have always been there.

Automated monitoring stations with alarms should be placed below all storage facilities. Monitoring wells should surround the vertical oil and gas wells, and should be capable of detections at each aquifer level above the target oil and gas layer. Frequent site inspections should be mandatory.

Since protective well sealing materials and casings can decay over time, ongoing tests are needed. Surface water and groundwater at each aquifer layer should be tested regularly during operations and for many decades after well abandonment.

**What can cause loss of water supply?** Large quantities of water are required for oil and gas industry operations. Amounts vary depending upon the geologic formations. Most of that water is lost from the hydrologic cycle forever. A new, substantial demand for water would certainly impose a significant stress on the County's limited water resources.

The County should consider prohibiting or severely limiting use of County water resources, both fresh and brackish, for drilling and for fracking,

**Summary** - All waters are crucial to the health, welfare, and safety of the County citizenry. Heavy oil and gas industrialization creates a real and significant, multifaceted risk to the County's water resources. Before authorizing industrial operations, the County should require that vigorous protections and monitoring are in place, and that there are strong enforcement incentives for the industry to employ effective protective practices.