LENDING A HAND

Water woes improve dramatically for the people of Laguna Pueblo

While the modern world appears to be preoccupied with oil and its many (ab)uses, there are vast stretches of parched and thirsty land where all forms of life – plant and animal alike – strain for water. In the desert plains of New Mexico, where 8 inches of rain may fall each year, it has been that way for thousands of years.

The state is home to the Navajo, Apache and Pueblo cultures. Most Native Americans living there today are the descendants of people who settled there long before the intrusion of European explorers. And still today, their lives, to a great extent, are shaped by hardship and struggle. Among the greatest needs is the necessity for water, the most precious commodity on earth.

With a population close to 8,000, the Laguna Pueblo – stretching across a large area 45 miles west of Albuquerque – is one of the largest pueblo groups. Archeologists believe that Indians have lived in the area as far back as 3,000 B.C. When the Spanish arrived in the 1500s, they found an agrarian lifestyle and sophisticated system of self-governance.

The Laguna pueblo consists of six villages – Encinal, Laguna, Mesita, Paraje, Seama (connected together by 98 miles of water distribution lines) and Paguate, the only community with its own well-water system.

Indian Health Service (IHS) provides sanitation facilities for Indian homes under Public Law 86-121, which was signed by President Dwight D. Eisenhower on July 31, 1959. The passage of this act was a milestone in Indian health legislation, and lead to the creation of a Sanitation Facilities Construction (SFC) Program within the IHS.

The SFC Program is the environmental engineering component of the IHS health delivery system, providing technical and financial assistance to Indian tribes and Alaska Native communities. Its key task: cooperative development and continuing operation of safe water, wastewater, and solid waste systems, and related support facilities.

Meeting the challenge

For eight years, CDR David Steen, PE, senior field engineer, IHS, Albuquerque Service Unit (ASU), has helped carry on the SFC mission by assisting Indian communities improve water delivery and quality in New Mexico.

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After all, something had to be done. Over the years, and with growing frequency, water lines were replaced on an as-needed basis. "There were, and still are, numerous old galvanized pipes that have rusted to the point that even pressure surges in the system can cause ruptures," Steen says.

Beginning in 2002, ASU worked closely with the Pueblo's Tribal Engineering Department, and then later with the Laguna Utility Authority once it was formed in 2006, to set the stage for the USDA-Rural Development Phase 1 water system improvements. The RD Ph. 1 project consisted of three new water tanks installed along the Rio San Jose Valley water system to provide storage capacity in closer proximity to actual demand and create pressure zones to better match the varying elevations throughout the system.

Watts tank fill altitude control valves with upstream pressure sustaining option were installed at two of three holding tanks (they were not required at the highest tank in the system).

The control valves not only prevent overtopping of the tanks and the wasting of water, but the upstream pressure-sustaining feature was chosen to prevent un-checked flow from the high tank to lower tanks in the event of a major water break.

"Major water breaks in remote parts of the system can go unnoticed for several hours or longer and could drain the system much faster than it can be replenished by the supply wells," Steen says. "The valves act as a tourniquet being applied to an artery in an arm or leg, enabling the whole system to be saved. Though, it's much better than that because the stopping of water happens automatically."

According to Steen, with the 8- to 12-inch lines throughout much of the system, if a serious leak were to happen without the Watts valves, it would be easy to lose 100,000 gallons before the leak could be arrested.

"A key need was to maintain enough pressure in the system at all times," says Elbert McKinlay, regional sales manager for Watts. "We chose altitude valves with a sustaining feature. The one-way altitude valves fill the tanks when they're low but also to maintain back pressure to assure a minimum pressure of 35 to 40 psi at all times, important for routine demand throughout the system, but especially important if needed for fire control."

McKinlay says the valve assemblies at Laguna also perform another important function. "There's a delayed-opening function so that the valves don't automatically fill a tank with every reduction in the water level. When the valves open, they open wide after a tank's level drops 8 to 10 feet."

When fresh water rushes in to re-fill a tank to pre-set level, the inrushing water is forceful, helping to keep each tank's volume of water fresh and "stirred-up."

"We're very pleased with the level of control we could achieve with the Watts valves and, now after several months of service, the performance of the equipment as well," Steen says.

Phases 2 to the rescue

While Phase 1 changes and improvements were thorough, limited funds could only take the project so far. And though the system today is a huge improvement over water delivery and safety before the IHS-SFC program was enacted, an even more ambitious USDA-RD Phase 2 project soon is ready to begin.

The Pueblo of Laguna Utility Authority (PoL-UA) received its start in 2006. In 2009, with the hiring of Leonard Otero as general manager, the UA initiated a strategic

approach to meeting infrastructure needs. Today, the authority's responsibilities include water, wastewater, solid waste, broadband and – *surprise* – grave digging.

While driving up the twisted, rugged pass so that he and others could inspect the Encinal springs, Otero says that the village of Encinal gets all its water from the 14 clear water spring sources. These are protected by concrete "ovens" with locked, stainless steel access doors. Based on a modern day "petroglyph" left at the ovens, the UA believes that the first ovens at the springs were built in 1964, providing at the time at least rudimentary protection to public health.

About two miles from the spring source is an old, 30,000-gallon tank that soon will be replaced with a 125,000-gallon welded steel tank. It will be erected next to the new treatment facility where water passes through a series of back-washable and disposable filters, with a progression of finer and finer pore sizes all the way down to 1.0 micron (0.0004 inches).

This level of filtration cleans and purifies the domestic water supply prior to reaching the first point of use in either Encinal or the valley water system and allows the UA to meet the EPA Safe Drinking Water Act by removing Giardia and Cryptosporidium.

One of the more interesting facets of the new treatment system is that it doesn't rely upon pumps to generate the necessary hydraulic pressure. While that was the initial plan, McKinlay and Steen revised and improved the design to include a Watts Mustang Series upstream pressure sustaining control valve in an in-ground vault.

In essence, the hydraulic pressure in the pipes, running downstream from the mountain source, creates sufficient pressure to force water through all the filtration.

Combined with the tank altitude control valves in the valley system, all of the valves will soon be tied into Laguna's SCADA (supervisory control and data acquisition) technology with remote monitoring of pressure, tank volume and flowrate.

The SCADA network, soon to be part of the UA's utility management arsenal, is something the UA's Neal Kie is eagerly anticipating. "When the SCADA network is up as part of the phase two improvements, I'll be able to monitor tank levels and system pressure, and also flow from the springs," he says.

Now that all of the Phase 1 dust has settled, the residents of Laguna Pueblo are ready for a much dustier project: the much larger, $26 million Federal loan/grant Phase 2 project – now at 100 percent of design and nearing full approval from USDA-RD, that will upgrade and replace all domestic water supply systems, components and piping for the other villages not upgraded in Phase 1, Steen says.

Phase 2, with all work designed by a Bohannan-Huston Inc., a civil engineering firm based in Albuquerque, is expected to go out to bid in spring or summer 2012. Phase 2 work – with more Watts technology to be installed – is expected to happen over a period of 18 months to three years, and may ultimately include some wastewater work as well. ■