By Jon Steele, Technical Assistant

The Question of Water System Viability and Sustainability

The water system in Corbin, Kansas was installed in 1996 with grant funds as a Superfund project due to groundwater contamination. The project which cost $5 million today has only 10 customers and struggles to have adequate funds for operations and maintenance. The photo above is of the project sign that remains on the side of an old building in town.

This article is about a key and critical part of a water system operations program, sometimes referred to as system sustainability. It appears the overall goal is to not just focus on complying with regulations, but also to have systems assess their long-term ability to provide adequate water service while adapting to new regulations and customer demands. While the issue of system viability and sustainability is important and sounds good, it cannot change the situation that many small systems have. The situation is that many of these systems serve very small rural communities that can only become viable with growth in the community. That's where on-site technical assistance is critical to helping these small systems sustain themselves.

This article is about a very small water district that was formed at Corbin, Kansas following a discovery of groundwater contamination of private wells with carbon tetrachloride, a common pesticide used in grain storage in the 50s and 60s.

Corbin is located about midway between Wellington and Caldwell in Sumner County. The community had no public water supply system. The 20 local residences were served by their own private wells. The remedy to the groundwater contamination was to construct a public water supply system, to be known as Sumner RWD 7. The water supplier was to be from a neighboring public water supply system, Caldwell Utilities, which at the time was a privately-owned system that provided water to citizens of Caldwell. The city of

KRWA Tech Assistant Jon Steele points to the manganese and iron deposits that were removed from the water storage standpipe. The tank had not been cleaned since the system was constructed. In the photo at right, Steele is vacuuming the deposits from the tank.

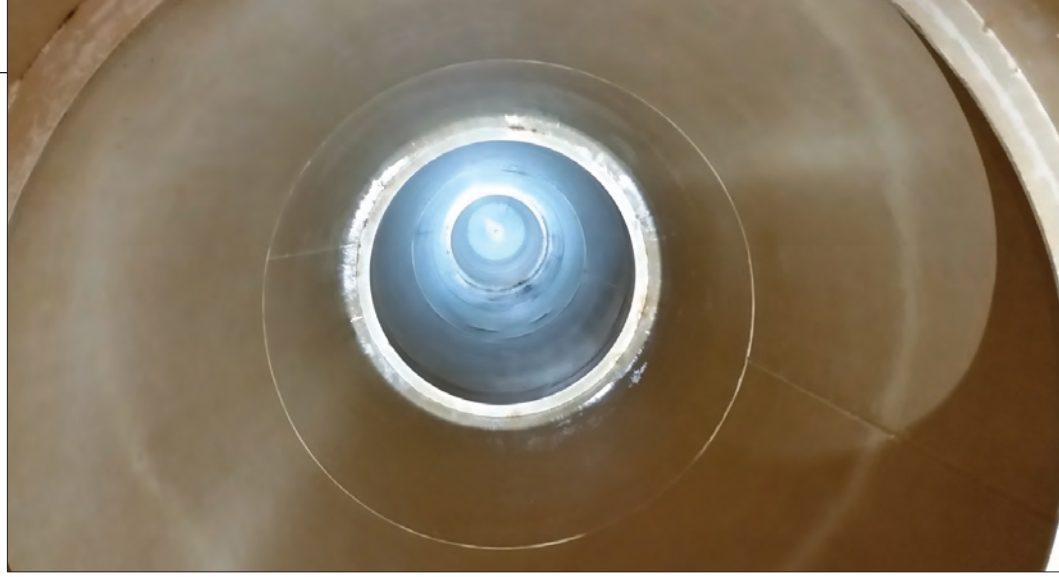
Caldwell later purchased the water system from Caldwell Utilities and it is managed and operated by the city today.

The assistance that was provided to the rural water system was with their storage tank and a routine cleaning and inspection. Most water managers know that the water storage tank is one of the most important components of the distribution system and has to be regularly cleaned and maintained. In the case of Sumner RWD 7 doing so was very challenging because of the low number of customers and inability to have a qualified operator/manager. Routine tank maintenance had never been performed. It wasn't until 20 years later and a KDHE inspection that this was revealed. The system is fortunate enough today to have a local customer that is very qualified to serve as the board chairman and system manager; she is very proactive and is doing a great job managing the small system.

I was glad to provide the assistance but I have concerns about the water system being viable and sustainable. They have a small customer base. The water system was originally constructed at a cost of $5 million; it consists of seven miles of four-inch and six-inch pipeline; it has two storage tanks, a booster pump and gas chlorination station which KRWA has also provided assistance with. All of this project to provide service to 20 customers. Presently there are only ten customers.

Lack of operating capital was one of the reasons the tank was not regularly maintained. How does anyone expect such a small system to even afford basic maintenance without raising rates to a level that customers could not or would not pay? The present rate is $15 minimum with no water included and $9 per thousand gallons for all water used. The system cost per customer is extremely high and one has to ask the question at what point will it become not feasible? It seems like it may have been better to install point of use devices on each home with a maintenance plan and forget building such an elaborate system or somehow find 100 more customers to share the expense. While that was attempted by the water district, it is not likely to happen. It begs the question why the system was promoted and constructed by agencies. The system was funded from the EPA Superfund with CDBG funding for a 100 percent grant. Were there not less expensive options?

The system is well-constructed with quality materials. But there would have been ways to reduce the costs and have a



This photo was taken from the top of the storage tank following cleaning. The tank is in remarkable condition even after 20 years of service and no maintenance having been done.

simpler design which in my opinion would have reduced the initial costs and the operational costs. The design unnecessarily complicates the routine operation and maintenance of the system. The system has required only minor repairs until now but after 20 years even a well constructed system is going to show its age and start to need more extensive work such as tank sandblasting and recoating.

In the operation of a water system there are many expenses to consider along the way such as meter replacement, tank coating, chlorination systems that need replacement, control system issues, booster pump replacement and the list goes on. It brings me back to my original question how anyone expects ten customers to maintain a project that cost $5 million to build and have a water bill that is affordable? Most likely more public tax dollars will have to be spent to prop the system up when a major expense such as repainting the storage tanks occurs. Given the chance of putting it to a vote, somehow I don't think that the common sense people of Kansas would have seen it as a viable investment nor a sustainable system.

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Tech Assistance on Cleaning Tank

I recently worked to clean the storage tank. It was actually somewhat fun and generally easily accomplished in a day, however planning and actual preparation took longer than the actual cleaning process itself. The trick is always to be able to maintain system pressure to the customers and yet not over-pressurize the system while doing the work. Then there is always the issue of bacteriological testing once the process has been completed before the tank is placed back into service. The sampling must be completed and the lab results must be verified to be negative before the water from the tank is allowed to be used in the distribution system.

The easiest way to deal with the pressure issue is to have a pump control system that is capable of sustaining adequate pressure. By this I mean by using a VFD drive coupled to a pressure transducer and setting up the drive to maintain the desired pressure by controlling the rpm of the pump motor. Chlorination rate fluctuation is going to be a problem unless there is a variable rate chlorination injection system but an acceptable average can generally be achieved in most systems without that additional equipment.

If there is no VFD system present, there is always the old method using a pressure relief valve which means installing

a relief valve on a fire hydrant, starting the pump and letting it run for the duration of the maintenance work. The valve must be set to pop off or relieve the excess pressure and the excess pressure or water goes to waste. This method can be expensive if the system is purchasing water or treating surface water. The next method is to install a pressure tank into the distribution system and set the pumps up on a pressure switch and allow the pumps to cycle based on the system demand. The tank acts as a surge tank or reservoir giving the water a place to go when the distribution system demand diminishes preventing pump short cycling. However they can be tricky to set up to provide satisfactory operation and maintain even system pressure. KRWA has two such tanks and they are used fairly frequently.

In the case of Sumner RWD 7 at Corbin, the control system with VFDs did not exist and there was no money to install this type of system. So we used a pressure relief valve installed on a flush hydrant at the end of the system and allowed one small pump to operate continuously with the tank isolated from the system through a gate valve. Once the tank was opened, we found a four-inch layer of black muck at the bottom of the tank. Knowing the water quality of the water along the river basin where Caldwell's supply is located I was pretty sure that is what would be found. It was precipitated iron and manganese in the bottom of the tank and it resembled crude oil in color.

After the tank was thoroughly cleaned and washed down with a 200 mg/l chlorine solution, we closed it and filled the tank. It was allowed to fill overnight and overflow, until a sample could be collected the following day. The tank was kept isolated from the system by maintaining the positive pressure and allowing it to overflow until the results of the bacteriological test were known. Once the lab results were reported as negative, the pumps were switched back to normal and the tank was placed into service. The district chairman/manager reports now that the chlorine residuals are better and much easier to maintain after the cleaning process.

KRWA summarizes many of the technical assistance efforts. And KRWA posts these reports on the Association's website. No login or password is required to access information on KRWA's site. You can find a report on this assistance under “Technical Assistance” and then “Letters”. Here is a direct link: https://krwa.net/Portals/krwa/documents/letters/171119SumnerRWD7.pdf

I hope that readers will consider attending the 2018 Annual Conference & Exhibition, March 27 – 29 at Century II Convention Center in Wichita. This is a large event, and it provides an extensive technical program and without question, one of the largest exhibitions for water and wastewater utilities in the U. S. And if anyone from KRWA can be of any help, this Association is ready, willing and able. And when you call, you'll be able to talk to someone and you'll be given answers.

Jon Steele has been employed by KRWA as a Circuit Rider since 1995. Jon is certified as a water and wastewater operator. He has more than twenty-five years experience in public works, construction and industrial arts.