by Doug Guenther

Leak detection – rewarding but can be very contentious

There are various methods for detecting water distribution system leaks. First of all, many cities and rural water districts immediately assume "there's a leak!" when in fact, the utility has done little if anything to correctly calculate unaccounted for water loss, much less eliminated all the obvious contributors to high unaccounted for water loss. Those obvious contributors would be incomplete reading of users' meters, verifying master meter accuracy, proper recording of production and usage, etc. For the purpose of this article, let's assume however that those 'obvious' contributors have been eliminated and that there may indeed be water loss from the distribution system.

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At KRWA, the common method used to attempt to locate pipeline leaks involves the use of sonic leak detection equipment. That equipment identifies the sound of water escaping a pipe. Sonic leak detection equipment can include pinpoint listening devices that make contact with valves and hydrants, and ground microphones that listen directly on the ground. In addition, KRWA has a correlator device that can listen at two points simultaneously to pinpoint the exact location of a leak. The biggest factor in the use of any of the devices is the experience of the person(s) operating the equipment.

The winter of 2007 was a challenge in locating three leaks for two small town systems. The three pipeline leaks I'm referring to in this article have all been located and repaired, however, they jeopardized the two water systems' ability to maintain adequate pressure. In one case, at the city of Damar, the entire storage tank was drained. The amount of the initial leak was also wasting more water than the city could purchase from its supplier, Rooks County RWD 3. At 18 gpm, there's not a lot of flexibility

Grainfield City Council Member Joe Heier uses a concrete saw to make way for the backhoe to finish excavating the water main leak on the state highway and main street of Grainfield in January, 2008. The elusive leak caused concern with KDOT workers who saw the highway slowly develop a 20 yard patch.

to add to storage with 100-plus customers also using water.

Shortly before Christmas, the city of Damar located in Rooks County in northwestern Kansas, contacted me and informed me that usage was increasing. The city requested help. The incoming 18 gpm from Rooks RWD 3 was inadequate to stabilize the level in the city's water storage tank.

I conducted a direct contact survey at Damar. A contact survey is when the leak detection equipment is placed directly onto meters, valves, hydrants, etc. to attempt to detect the sound of water escaping nearby. I located an area where I suspected pipeline leakage. There was a fairly loud sonic sound despite the interference of wind and having water pressure less than 30 psi. The water escaping the pipeline could be heard from two customer meters and one fire hydrant in the area. In contacting the local phone company for a locate of their services, the technician also located the water main line and the customer service lines in the suspect area. I used the ground mic to attempt to pinpoint the location of the leakage by placing the mic directly over the pipeline on one-foot intervals. I could not hear the leak anywhere. Next, we used a hammer drill to remove paving to get closer to the pipe. We probed also, hoping to find wet areas. We had no success with this approach. Another option would be tried.

We reviewed the city's maps. We inserted a 2-inch valve on a 2-inch galvanized pipeline to better isolate a section of the pipeline where I had previously detected the sound of escaping water. We closed the valve. Immediately the leakage stopped. We had correctly identified the pipeline that the leak was on.

The section of 2-inch pipe was very corroded; I recommended that the city replace it. I can only assume that the reason we could not locate the leak with a probe was because the water was draining downward. One customer on this main was supplied with water with a temporary service line run above ground until a contractor could bore and insert a new main after the New Year. By the time we finished with the project, it was the end of two days of somewhat frustrating work; it was cold and a blizzard was moving in.

Happy New Year!

On New Year's Day, the city of Damar again called. There was another problem with water loss. The pressure was below 20 psi and in no way could the city provide service to the customers and resupply their elevated tank. With such low pressure, trying to hear the sound of moving water is next to impossible. All sections of the distribution system were shut off in order for the 18 gpm incoming supply to replenish the city's

The end of the 20 plus yard-long trench is shown above. The point of the leak is seen with the water bubbling up in the hole. The crews covered the trench as they moved north so the main wouldn't freeze behind them. The frozen ground and type of soil kept the ground mic from pin pointing the leak exactly. The leak was found half way between the fire hydrant where it was first heard on the mic and the storm drain where it was heard draining into.

storage. The next day, using similar methods as on the previous leak, I detected a leak on a 2-inch cast main. The pipeline had broken, likely due to ground movement because of the deep frost. This leak was flowing into a 6-inch sewer main 45 feet to the east. The city tank began to regain supply after this leak was repaired.

The second system to call with similar water loss, low pressure problems was Grainfield. I detected the sound of escaping water near Front and Main Street using the 'contact method', touching hydrants, meters and valves in the immediate vicinity. Further investigation revealed that a leak of about 70 gpm was flowing into a storm drain. The city contacted the Kansas Dept. of Transportation (KDOT) as the leak was on a state highway and also the phone company for locates. The phone company tech was gracious enough to also locate the water main. The suspect area of 4-inch cast iron main was about 80 yards long; KDOT wanted the excavation to be kept at a minimum. Of course, so did everyone else. We listened to the area with the ground mic. This indicated that the leak was near the fire hydrant about forty yards north of where the water was pouring into the storm drain. But the leak was not on that section. Eventually, we located the leak approximately 20 yards north of the storm drain; it was repaired and the system was back to full restoration.

While the details of locating these three leaks may not seem important, both cases were critical issues for the respective cities. There's no tolerance for a city trying to provide water service to 100 plus customers when there is only a supply of 18 gpm as in Damar's case. Grainfield could not withstand a 70-gpm loss for very long without a complete loss of service to customers. KRWA was pleased to be of assistance to both communities.

Doug Guenther affixed the full circle leak repair shown above. Because of the wind and cold weather, the city repair crew was happy to see the leak's excavation backfilled and the patch put on the highway surface above.

As water resources become even less available in some areas, water loss reduction will become increasingly important. Maintaining a good distribution system requires that records concerning water production and sales be scrutinized monthly. Meters need to be tested, read and propertly recorded. While there may indeed be losses from the pipeline, city hall or the RWD office may also not be billing correctly for water sales or services provided. The physical and the financial losses often run parallel, resulting in a utility that only goes downhill. We need to all work together to avoid such situations.