Well well

Innovative well pipe repair restores volume of city well from 250 to over 500 gallons per minute; conversation with engineer leads to solution

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PARK FALLS -- Dennis Wartgow worries a lot even though worrying isn't in his job description as city streets and water superintendent.

Worrying about the city's water, sewer and streets infrastructure inevitably is part of his job, and he had more than usual to worry about a few months ago when he found that the volume of water coming from a city well on County Hwy. B had dropped from about 500 to 250 gallons per minute.

He doesn't worry alone, and it wasn't long before he had Mayor Eugene Schneider, the public works committee and the common council just as worried about the problem as he was.

If the problem would have just been a matter of partial clogging of a stainless steel screen through which the water is drawn in the vertical pipe coming from the well, it would have been solved with the cleaning of the screen that has to be done every eight to 10 years because of a problem with manganese and iron in the water supply.

According to Wartgow, he and public works employees helping with a recent cleaning of the screen discovered the cause of the water loss during what he described as a sonar jetting process. It involved dropping small blasting caps to three levels of the screen and setting them off to jar sediment loose.

He said the screen is then washed and cleaned out with a phosphate solution, and then the screen is tested by use of air pressure and checked by televising the interior.

Wartgow said they found two small holes, each a couple of inches in diameter, right where the stainless steel screen is welded to the casing.

Wartgow wasn't worried about being able to repair the leaks, because there is a traditional way of doing such repair. He said it involves putting a smaller screen inside the larger screen and putting a gravel pack between the two. He said the screen in the Park Falls well pipe was 26 inches in diameter, and the smaller screen would have had to be 20 inches in diameter.

The problem was that type of repair would in effect reduce the size of the well pipe, resulting in a one-third loss of the capacity of the well to provide water. The well would have dropped from its original capacity of 500 gallons per minute to 335 gallons per minute.

Wartgow said that's no small loss for a city like Park Falls, which has limited options for maintaining a dependable water supply for its residents.

Fortunately for the city, Wartgow shared with engineer Michael Davy of Davy Engineering, Madison, his frustration with the city's having a well that can provide 500 gallons a minute but being limited to 350 gallons per minute because the size of the well pipe in effect had to be reduced in order to repair the leaks.

Wartgow told Davy that he would think that at a time of great advances in so-called trenchless technology for providing and maintaining public utilities, something would have been developed to enable repair of a well pipe without having to accept loss of water volume as a result.

He said both were aware of trenchless methods to repair horizontal water and sewer mains, but there was nothing in the engineering trade literature about any method having been developed for repair of vertical pipes.

Davy agreed that there was an apparent void in the technology where vertical pipes were concerned. He and Wartgow decided to launch a search to see whether there had been any trial trenchless repair projects anywhere that had escaped notice in the engineering and public works trade publications.

During that search, a representative of a firm called Infra Tech informed Wartgow in a telephone conversation that at least two such trenchless vertical pipe repair projects had been tried in the Midwest, with apparent success.

He said the Infra Tech firm was not the one involved in those projects and had never undertaken anything similar.

“They were interested in giving it a try and shot us a proposal. It was about one-third the cost of dropping a screen and gravel packing, and we thought it was worth a try,” Wartgow said.

The city had to go through a Department of Natural Resources approval process, which took several months, Wartow said. He said that as far as he knows, Park Falls was the third in the nation to undertake such a well pipe repair project.

After approval was granted, Infra Tech came to Park Falls to do the repair with some equipment and materials Wartgow had never seen. They included a ratcheting stainless steel “sleeve” obtained from a Canadian firm called Link Pipe, a large inflatable balloon, and a two-part epoxy sealant.

He said the Infra Tech technicians put the balloon, with a rope attached, into the sleeve. They applied the sealant to the exterior of the sleeve, which had been covered with a fibrous material to absorb the sealant. Using an attached chain, they lowered the sleeve into the pipe to a point 71 feet, one inch from the top, which they had meticulously calculated to be the distance at which it would be enclosed by the portion of casing in which the holes were located.

Wartgow said they also had calculated how far outward the sleeve would have to be ratcheted in order to be pressed against the inside of the well pipe casing for the epoxy to take hold. Air was forced into the balloon, with a gauge showing the pressure in the balloon in order for the technicians to know when it was sufficient to ratchet the sleeve outward and press the epoxied outer surface of the sleeve against the inner surface of the casing. The ratcheted sleeve was submerged in 40 feet of water in the pipe during the process.

The pressure in the balloon was then held for 30 minutes to give the epoxy time to seal. The technicians then let the air out of the balloon and pulled it out of the well pipe.

Then came the big test, which to the surprise of everyone involved showed that the well capacity now exceeded its original design.

The city operates with two wells, and officials had been resigned to a gradually diminishing well capacity as a normal process. They had not expected the more drastic reduction in well capacity caused by the leaks, but also didn’t expect that the well capacity could ever actually be increased. Now they can breathe easier, with the likelihood of future problems with the water supply lessened due to not only the restoration of the original capacity of one of its wells but the slight exceeding of that capacity as well.

The cost to the city was $15,000. The entire project took about four months, from the time the leaks were discovered in April to the time the sleeve was installed in July.