"SATELLITES AND DOGS: AN UNLIKELY LEAK DETECTION TEAM"

By Jacob Gardner

Leaks are an issue for every water delivery system. The US EPA estimates that 14% of the water treated in many systems in the United States is lost to leaks. Leak detection is an uphill battle that we will never win, but a couple new techniques are emerging to help, Satellite and Canine leak detection.

Orbiting 434 miles above the earth's surface, a collection of satellites with microwave sensors are constantly scanning the surface of the earth. The satellites emit a microwave band that is able to penetrate up to ten feet into the earth surface and measure the returning waves interaction with the earth's surface. Different soils have different properties, and the satellites are able to identify saturated and wet soils when they fly over.

The data collected by the satellites is then processed through an algorithm on a computer. This processing allows different types of water to be identified. Since Chlorine has a specific "signature" when the electromagnetic waves interact with it, the algorithm can differentiate between ground and drinking water. The computer then returns points of interest where a leak may be occurring.

Analysis of the satellite data is further performed to determine the probability that a certain point of interest is in fact a drinking water leak. The points of interest are layered over GIS files of the distribution network to observe distance between points of interest and the distribution network. Points closer to the network are more likely to represent the location of a leak. The software will also analyze pipe material, pressure zones, previous leak history, and recent field investigation findings.

Identifying probable leaks is all well and good, but you still need the time and manpower to put boots on the ground and get to the points of interest with acoustic listening devices. Four systems in the United States have found a work around for labor and time shortages: canine leak detectors.

Armed with 300 million olfactory receptors in their nose, a dog's sense of smells can be up to 10,000 times better than a human's and allows them to detect substances at a concentration of one part per trillion. While dogs have been used for years to locate bodies and drugs, a few water systems have started training dogs to key in on the faint traces of chlorine found in drinking water.

The small amount of chlorine in drinking water will escape the water once it has left the pressurized distribution network and has entered the soil. The chlorine gas will work its ways to the surface through small pores in the soil and become detectable to the dog at the surface. Once given the command by their handler, the canine will zig zag and circle the area of interest until they are able to pinpoint the chlorine smell. The dog then gets its reward for a job well done: a ball! The canine leak detector can move much faster than a human utilizing listening devices and have no problem with plastic lines.

"Vessel, the leak detection dog from Central Arkansas Water"

The first known instance of using dogs for drinking water leak detection was in Australia in 2018. A second dog was put to work around the same time in the United Kingdom, and to date the United States has four publicly working leak detection dogs. The four working dogs in the United States are all bird dogs and the best candidates for training are dogs with high intelligence and "fetch drive".

It may be a little bit before we see widespread adoption of these two types of leak detection techniques. Satellite imaging can be cost prohibitive for smaller systems and bringing on a canine team can cost up to $20,000 in initial training, but I am looking forward to the day I'm greeted at an onsite by the wagging tail of New York's first leak detection dog. 💦💦💦

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