

# When the GNSS Mapping App you want doesn't Exist... Make One



It used to take Questar Gas inspectors half an hour to collect pipeline assets on a site and then eight weeks to produce a final map of the work. Today, using GNSS technology, data collection takes 10 minutes and the map is available instantly, reports Vivienne Wallace.

Questar Gas is a natural gas distribution company in the US servicing Utah, southwestern Wyoming and a small portion of southeastern Idaho. The company employs approximately 880 people. Tren Giles is operations supervisor of the GPS support/inspection group of 15 gas inspectors.

With a population of about 2.9 million people, Utah is one of the fastest growing states in the US, with one of the lowest rates of unemployment. So,

Questar Gas must meet a constant demand for piping in new residential and commercial developments, as well as replacing ageing existing pipework.

A critical aspect of Questar Gas asset management is accurately tracking, locating and recording pipelines. The company uses as-built information to better manage maintenance and to communicate accurately to other parties where assets are located. "We need to record where pipes are. Although we run a copper tracer wire along the pipe, the wire can get broken so we still need to do an as-built," explains Giles. Questar Gas also uses as-built information to accurately pay contractors.

The consequences of not knowing precisely where gas pipelines are located are well known: Questar Gas crews, or third parties, are unable to prevent damage from occurring or to respond quickly to repair faulty or damaged pipes. Time is wasted searching for pipelines. "We simply have to be able to locate that line," says Giles.

## Tape and Sketch – Three Times!

Until recently, in order to produce asbuilt maps, Questar's inspectors were obliged to first measure distances using a tape, then roughly hand sketch a map on the job. Later, often from the company vehicle, they drew the map a second time in simple CAD software on a laptop. This version was sent to a postmapping team, which drew the map a third time. The entire process was labourintensive and lengthy, taking approximately eight weeks, and was vulnerable to human error.

One particular down side of the long process was the inability to quickly communicate asset location to third parties. On a big project, it could take months to deliver a map to third-party contractors, e.g. to companies that mark utility locations where people have indicated they want to dig. The lack of information caused considerable delays on other companies' projects.

At the time of data collection, inspectors would attempt to "tie" the location of pipes to local features such as buildings, curbs or fences. This practice was problematic; over time the environment could change causing the feature to be displaced or moved. For example, if a street was widened, then curbs would no longer be the same distance from the pipe recorded during mapping.

## A Workflow that Works

Questar Gas wanted to improve its accuracy and produce maps faster by developing a workflow to collect positioning information with GNSS. It would then integrate the new data with existing data in the company's Esri database. However, when they decided to introduce this change, no software solutions were available to fully meet its needs.

Questar Gas reached out to CartoPac, a software development team in Fort Collins, Colo., to help them create a mobile application for mapping gas pipelines. CartoPac has expertise in using Trimble GPS Pathfinder tools to create GIS applications.

The project included not only workflow and application development; they also trained gas inspectors to be mapping experts. Within a few months, Questar Gas had a working model, which has been steadily updated ever since. The company now uses

GNSS technology to map its services, mains and structures. The data they capture, accurate to within 10-15cm, is standardised and is immediately accessible in the company's Esri GIS database by third-parties like support personnel, construction contractors, location specialists and leak survey inspectors.

Questar Gas runs its mapping application on a mix of Trimble GeoExplorer 6000 and the more recent Geo 7X handhelds. "I appreciate our Trimble equipment," Giles says. "We use it as hard as, or harder than, anyone. Most of our systems are used eight to ten hours a day, five to six days per week." The handhelds are run on a rover pole with a Trimble Zephyr antenna. If inspectors are unable to collect a point by positioning the rover pole over it — for example, at the corner of a building — then they use a laser rangefinder, also attached to the pole, to reach the point.

Questar Gas connects to Utah's Trimble VRS network, which provides realtime, 10cm accuracy through a network of landbased reference stations. Where the network is not available, GNSS data is post-processed for 10-15cm accuracy by the next day. "We went with a real-time workflow so we could collect data and know what was being collected straight away," Giles says. When pipe is laid, Questar Gas inspectors take their equipment to the job site to measure the asbuilt construction of pipelines before burial. At that time inspectors are required to map, in Giles' words, "everything."

"The company is very particular about its maps," he says. "So they don't just measure mains. They include every pipe, every fitting and every structure the gas is run to. They also tie the location to as many features as they can, including fire hydrants and street lights, etc."

During mapping, the CartoPac software requires inspectors to complete data collection forms that cannot be exited until the workflow is completed. This constraint ensures all data is traceable, verifiable and complete; ensuring quality and peace of mind. "Our chief compliance officer loves what we're doing with GNSS," Giles adds. "He's one of our biggest supporters." Because data collection is now standardized and consistent, the results are not open to interpretation further ensuring data accuracy.

## Geo-referenced Photos

Another important feature of the mapping application is its ability to take georeferenced photos. "I have to say, the photos are one of my favourite aspects of using GNSS," Giles says. "The camera is in the tip of the unit, so in the CartoPac built workflow our inspectors can take a wide view of the riser location and then the service tap. It's really nice to have this picture because it lets you know what's in the ground." Giles adds that the photos are insurance against claims made against the company for transgressions such as window breakages or incorrectly installed equipment. They can simply email a copy of the photo to the claimant to prove Questar Gas is not at fault.

## Results

Since 2012, Questar Gas has used its new application to map 49,853 services and 2,583 kilometres of mains, all within an accuracy of 10cm.

"It's a simple fact that we now know where our gas line is buried," Giles says. "Plus we've dramatically improved our productivity, information accuracy, compliance practice, safety and overall asset management. We optimally manage our pipelines from laying to retirement." Giles adds that it's hard to quantify the benefits or the increased productivity. "Inspectors used to collect data by hand and draw it by hand," he says. "Now we can spend more time on detailed inspection, ensuring a higher quality job."

Another unexpected benefit of the new mapping system is that most Questar employees love it. Much of the company's workforce is ageing, but despite some anxiety about technology, the system has been adopted with enthusiasm because it makes the job so much easier and more enjoyable. One employee even plans to postpone his retirement as a result of his work days being so transformed.

## Into the Future

"We're constantly developing new workflows – we have lots of areas of interest to explore," Giles says, "and the program now does stuff that even I had no idea it could do."

Pipeline management at Questar Gas is also set to be enhanced with the barcoding of all pipes at the time of manufacture. When a pipe is barcoded, the company can scan it when it is laid. The pipe's information, including date of manufacture and attribute detail, is then integrated with the other data collected and communicated on the final map.

"We aren't using barcoding today full time because not all pipes are coming through with the barcodes yet, but we've done all the testing and are now just waiting for barcodes to be supplied on every pipe as standard," Giles says.

The Questar Gas brand is built on a promise to provide safe, reliable natural gas service at the lowest possible price. By creating a mapping solution to increase its efficiency, accuracy and productivity so significantly, the company is well-positioned to continue delivering on that promise.

*This article was published in GIS Professional October 2016*