



GNSS Pipeline Mapping: A Gas Company Takes Charge



Regardless of how the environment and features around a pipeline change, with GNSS technology Questar Gas knows exactly where the line is located.

When the GNSS Mapping App You Want Doesn't Exist, Make One

Questar Gas inspectors used to take half an hour to collect pipeline assets on a site, followed by eight weeks to produce a final map. Today, using GNSS technology with a mobile app they helped create, data collection takes ten minutes—and the map is available instantly.

Highlights

- ▶ Map creation in minutes compared to 8 weeks
- ▶ Higher quality data—pipelines located to 4-in accuracy in real time
- ▶ Traceable, verifiable and complete data via data-collection forms
- ▶ More time for detailed inspections for a higher quality job

overview

With the goal of improving the accuracy of its asset management data and creating deliverables faster, Questar Gas decided to use GNSS technology. Already a long-time user of Trimble hardware, they approached software development company CartoPac to create an app that would help them collect the comprehensive data they need and then deliver it as an accurate map.



Location
Salt Lake City, Utah,
USA

CHALLENGE

Questar Gas is a natural-gas distribution company 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 with fifteen gas inspectors working for him.

Utah's population of 2.9 million is one of the fastest-growing in the U.S. So Questar Gas must meet a constant demand for new pipeline in residential and commercial developments, and replace aged existing pipeline as needed.

As part of its service, Questar Gas asset management tracks, locates and records pipeline. The company uses this as-built information to manage maintenance, communicate asset location to third parties, and pay contractors. "We need to record where pipes are because we can't locate plastic pipes underground once they're laid," says Giles. "Although we run a copper tracer wire along the pipe, the wire can break so we still need to do an as-built."

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

To produce as-built pipeline maps in the past, Questar Gas inspectors used to measure distances with a tape measure,

then roughly hand sketch a map on the job. They drew the map a second time, often from the company vehicle, in simple CAD software on a laptop. A post-mapping team then drew the map a third time. This process was labor-intensive, eight weeks long, and vulnerable to human error. And it delayed the communication of information to third parties such as "Call Before You Dig" companies.

During data collection, inspectors "tied" pipe locations to local features such as buildings, curbs or fences, but over time environments changed, causing features to be displaced or moved. For example, if a street was widened then its curb was no longer the same distance from the pipe.

Questar Gas wanted to improve accuracy and produce maps faster by collecting positioning information with GNSS to integrate with existing data into the company's Esri® database. But no software solutions were available to fully meet its needs.



"The riser is too low and it's buried with dirt." To refute claims such as this, Questar Gas takes dated, geo-referenced photos to show that installation is correct.



Questar Gas inspectors work alongside service crews throughout a job so they can measure pipe as it is laid, without slowing the contractor down.

SOLUTION

With the assistance of their Trimble distributor, Questar Gas reached out to CartoPac, a software development team in Fort Collins, Colorado, to help create a mobile app for mapping gas pipelines. CartoPac has expertise in using Trimble® GPS Pathfinder® Field toolkit to create GIS applications.

The project included workflow and application development, as well as training the gas inspectors to be mapping experts. Within a few months Questar Gas had a working model for mapping services, mains and structures. The data they capture—accurate to within 4 to 6 inches (10 to 15 cm)—is standardized and immediately accessible in the company's Esri GIS database by company crews, support personnel, construction contractors, third-party location services, and leak survey inspectors.

Questar Gas runs its mapping application on a mix of Trimble GeoExplorer® 6000 series handhelds and the more recent Geo 7X handhelds. "We use our Trimble equipment as hard as or harder than anyone else," says Giles. "Most Trimble systems are used 8 to 10 hours a day, 5 to 6 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."

Questar Gas connects to Utah's Trimble VRS™ network, which provides real-time, 4-inch accuracy through a network of land-based reference stations. Where the

network is not available, GNSS data is postprocessed for 4- to 6-inch accuracy by the next day. "We went with a real-time workflow so we could know what was being collected straight away," says Giles.

When pipe is laid, Questar Gas inspectors measure the as-built construction of pipelines before burial. At that time inspectors are required to map, in Giles' words, "everything." "They don't just measure mains," he says. "But every pipe, fitting, and structure the gas is run to. They also tie the location to as many features as possible—fire hydrants and street lights, etc."

In the CartoPac app, inspectors complete data-collection forms that cannot be exited until the workflow is completed. This constraint ensures all data is traceable, verifiable and complete for quality and peace of mind. "Our Chief Compliance Officer loves what we're doing," says Giles. "He's one of our biggest supporters." Because data collection is standardized and consistent, the results are not open to interpretation. This further ensures data accuracy.

"I also have to say the georeferenced photos are one of my favorite aspects of using GPS," says Giles. "The camera's in the tip of the unit, so in the CartoPac-built workflow our inspectors can take a wide view of the riser location¹ and then the service tap. It's really nice to have this picture to show what's put in the ground." The photos insure against claims made towards the company for transgressions such as window breakages or incorrectly installed equipment.



RESULTS

Since 2012, Questar Gas has used its new application to map 49,853 services and 2,583 km (1,605 mi) of mains, all within an accuracy of 4 inches.

“It’s a simple fact that we now know where our gas line is buried,” says Giles. “Plus we’ve dramatically improved our productivity, information accuracy, compliance practice, safety and overall asset management. We optimally manage our pipeline from laying to retirement.”

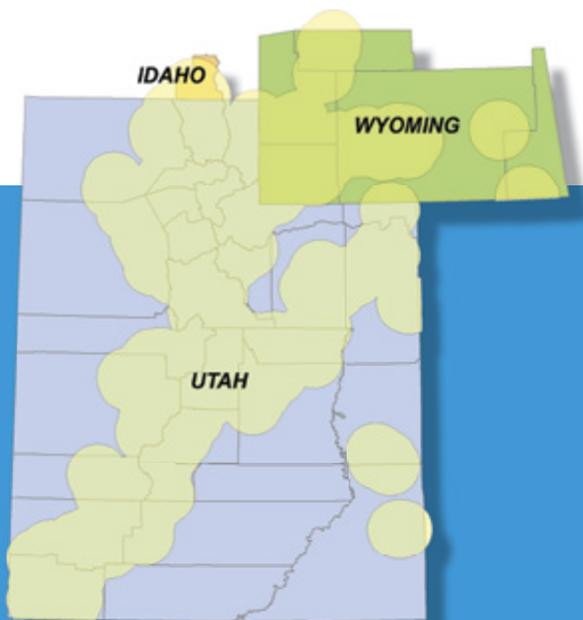
Increased pipe location accuracy enables Questar Gas to respond to pipeline problems more quickly and efficiently. For example, isolation holes, which are required 50 ft (15 m) from pipe damage, are dug once only. It also reduces the risk of pipe damage or tear-outs.

Giles adds that it’s hard to quantify the benefits or the increased productivity, but now employees can spend more time on detailed inspection, ensuring a higher-quality job. Most Questar employees find their jobs are much easier and more enjoyable.

Next Steps

“We’re constantly developing new workflows—we have many areas of interest to explore, such as incorporating bar coded information on new pipes into the process.” says Giles. “And the program now does things that even I had no idea it could do.”

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.



1 The riser is the vertical portion of the service line that connects the pipeline to the customer’s meter.

“We need accuracy we can rely on, so GNSS technology is gold to us.”

Tren Giles
Operations Supervisor
at Questar Gas

The Questar Gas company’s service extends beyond Utah into neighboring states.



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