Fulcrum

**Case study**
Water utilities

Trekk Design Group

# Innovative water utility inspections using GIS, 3D imaging, and Fulcrum

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TREKK

**Jared Carey**
Innovation Specialist

## Challenges

Needed to replace outdated paper-based inspections with a digital solution compatible with existing Access databases and Esri ArcGIS Online

Field data collection quality control issues ranging from inaccurate or irrelevant data and/or missing location information

Inspections of incorrect assets or structures within complex lines or grids due to inaccessible or missing spatial components

Frustration in the field and home office fighting with non-purpose-built inspection and data collection tools while trying to deliver on customer reporting and compliance requirements

Unreliable hotspots and internet connection results in teams “flying blind” in the field, unable to access databases or reliably collect information

## Key Outcomes

Ability to rapidly create customized, “smart” client and project-specific mobile inspection apps that enable data integration and use across GIS, asset management, and other client operations platforms

Guaranteed data accuracy and consistency using mobile inspection apps that make use of data-driven conditional and required field logic coupled with automatic latitude and longitude tagging of every record and data point

Asset inspections are validated by ensuring that the right location data flows directly from the GIS to the inspector’s handheld device

High field adoption and engagement with user-friendly mobile inspection apps created using a wide range of data types, conditional logic and streamlined workflows to deliver automated, turnkey reports included in GIS deliverables

Fulcrum’s offline data collection not only allows teams to use databases but also to collect geotagged information for later syncing, without worrying about a network

> “In addition to ensuring our field teams are consistently collecting the right data in the right format using the ‘smart’ inspection apps we design, we also leverage Fulcrum to automate turnkey reports we include in our GIS deliverables.”

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## Background

TREKK Design Group, LLC (TREKK) is a regional civil engineering firm based in Missouri founded in 2002 with the mission to engineer holistic, commonsense solutions that support the growth and restoration of the communities it serves.

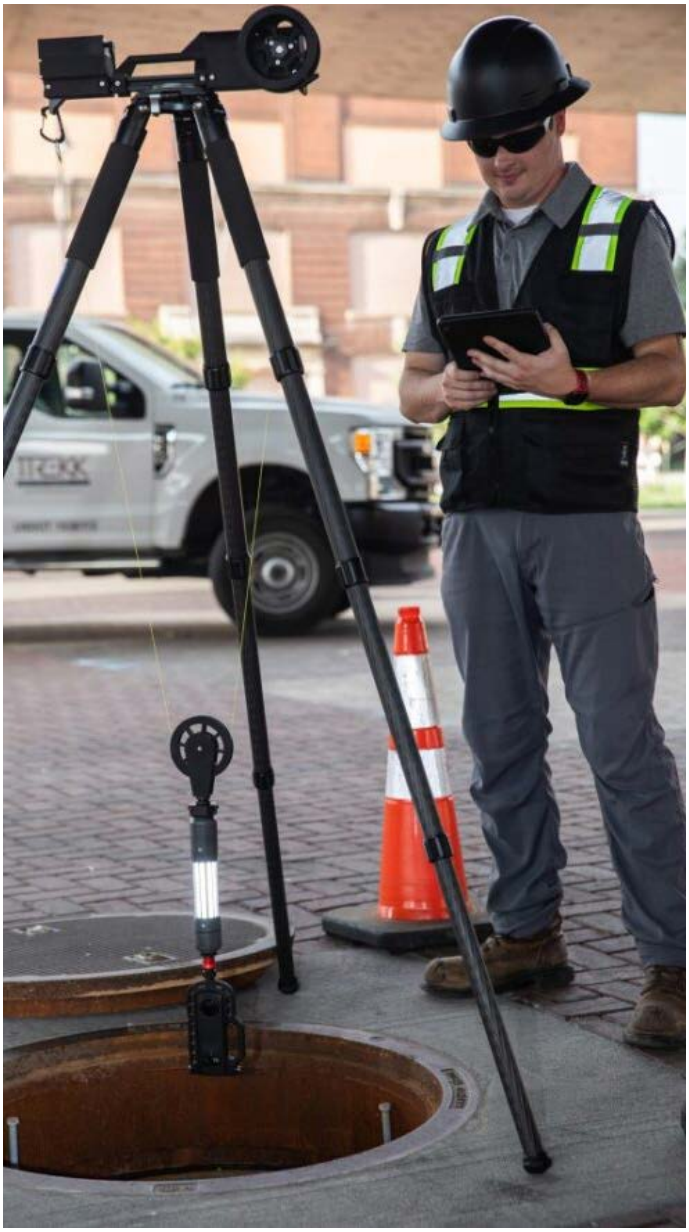
TREKK provides a wide range of expertise to municipalities, specifically for utilities and transportation, encompassing design and planning, geospatial information systems and asset management, and construction engineering and inspections. TREKK aptly describes its services portfolio as follows: “Need a road designed? We can help. Want to understand your underground infrastructure? We can do that, too. Have a problem and just need a commonsense solution? We’ve got you covered.”

## Complementary field ops technologies deliver big-picture solutions

TREKK leverages a powerful technology portfolio which includes Fulcrum’s field data collection and process management platform, the Esri ArcGIS Online geospatial information system (GIS), and 3D imaging software to deliver to its clients a 360° view of their field assets and utility operations.

Jared Carey, Innovation Specialist at TREKK, describes how his company stays on the leading edge: “Basically, we do consulting, we do civil engineering, we do underground inspections, structural inspections, anything that involves civil engineering. And we are leveraging technology to make that experience better, smarter, more relevant to modern times, more accurate, and more thorough.”

Carey has spearheaded the technology innovations for TREKK in areas such as surveys, underground asset inspections and inventories. For underground assets, it’s often the case that clients don’t know



exactly where all the assets are located, so TREKK is retained to perform asset location mapping and audits.

As Carey explains, “We’ll map the connectivity between different assets using ArcGIS—for example, these sewer pipes go from this manhole to this other manhole, or a cluster of manholes throughout the city. Then by layering in Fulcrum, we’re not just mapping the asset, we’re also collecting all the attributes, the condition, the structure design, the measurements, the big picture, and using this data to deliver a turnkey report that we include in our GIS deliverables.”

Harnessing the power of GIS data using Esri in combination with customizable digital inspection and reporting capabilities of Fulcrum enables TREKK to help clients inventory their utility assets, determine their current conditions, identify failure modes, rate risk levels, prioritize and establish maintenance plans, and develop long-term funding strategies.

## The power of purpose-built digital field inspection

When developing utility asset assessment and management strategies, TREKK makes a point to develop programs that maximize the value of its clients' existing platforms and data, while providing the best possible service to their users. In the municipal sector for utilities, many have already adopted Esri for their GIS needs.

Digital inspection is more of an open field, with many clients still relying on paper-based data collection, or free digital forms solutions that, as part of larger enterprise platforms, are not purpose-built to support required functionality and data accuracy.

Under Carey's leadership, TREKK folded Fulcrum into its technology tools for digital field data collection roughly seven years ago. "Initially we didn't really know which way we wanted to lean, but we were certain it wasn't going to be on paper anymore. So we had access to databases. We were getting into ArcGIS Online with Esri. Fulcrum offered the quickest, lowest cost entry point for building extremely sophisticated forms with data driven, 'smart' logic, designed to work with our other platforms," says Carey.

## Making field inspections easier

Carey notes other challenges of trying to implement successful inspection and survey components of Trekk's programs using paper or free ad-hoc solutions.

"We were doing manhole inspections that had 150 fields' worth of data to collect. It's hard when our crews have pencil and paper, and they also have their camera in hand, and they're trying to juggle it all. And when they're writing information down, they're sometimes messing things up because a paper form doesn't force their pen in the right form field with the right values."

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In addition, free digital form solutions that came along with some of its clients' existing GIS or field ops platforms were not much better. These solutions often lacked basic capabilities such as being able to quantify when and how many photos an inspector should take. Further issues included difficulty in labeling photos, not providing record or data spatial components, and inability of field teams to perform work when offline, all contributing to worker frustration and incomplete field data.

Carey shares a story from when he first introduced Fulcrum roughly seven years ago. "One of our field guys called me after hours and for 50 minutes pleaded to me: Please don't make me go back to the old way. *This is so much easier; we get so many more linear feet [of smoke testing] done in a day because of this platform. Because there's no internet issues, we can get our photos and run with the points that are easy to capture. There's no separate GPS system we're trying to juggle.* And from that day forward, the fire was fanned—everybody in the field wanted to use it."

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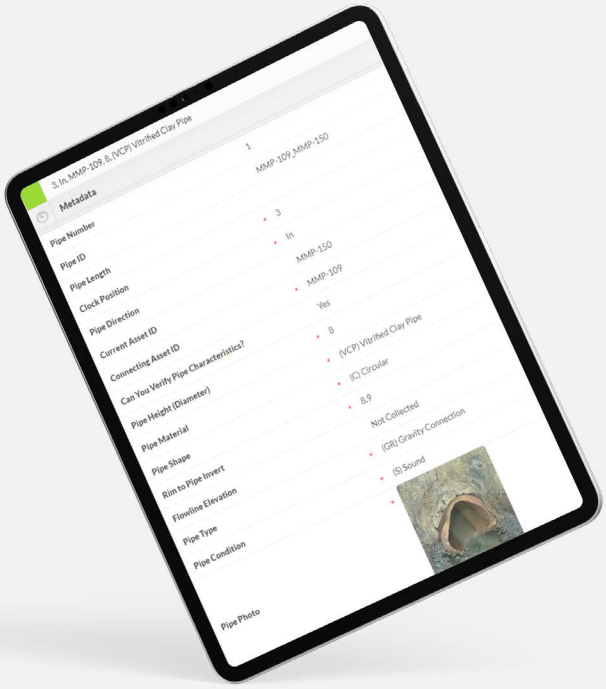


## The Role of Fulcrum at TREKK

While Fulcrum is key in TREKK's processes, Carey also acknowledges the role of other technologies, such as Esri's FieldMaps. "We sometimes use FieldMaps for specific tasks, such as location capturing, while still benefiting from the rich data that Fulcrum provides," says Carey. "And sometimes, we flip it around and Fulcrum collects the raw GIS record to guide our field crews and office technicians. Every project operates within a hybrid environment, where Esri and Fulcrum seamlessly integrate into a single map, with Fulcrum driving the data component."

While TREKK is an Esri shop, some tasks are simply too complex to do using Esri's location-centric platform. "We tried using Survey123 for NASSCO [National Association of Sewer Service Companies] scoring of manholes, but it was too hard to program the data integrity piece into a process. We now have a Fulcrum app that we programmed with all the NASSCO manhole scoring because it was impossible to do in Survey123, and it's not the kind of thing that Field Maps is designed for. We needed Fulcrum to get the job done."

Key to Fulcrum's advantage for these complex inspection processes lies within its ability to add custom program scripts. "I can't go into these other platforms and start typing JavaScript on the screen," says Carey. "Fulcrum, however, gives us the ability to legitimately program with JavaScript all that we want to see, if-then statements and all that. There's just more that we're able to do with Fulcrum than we can with either FieldMaps workflow or Survey123."

Fulcrum also has the edge when it comes to creating reports. As Carey explains, "With Esri, there aren't automatically filled reports. We must build our own. But Fulcrum gives us templates that are easy to use. We can start with the template and add our own touches by programming with JavaScript. For example, our pipe records include a clock position on them, so it shows connected pipes at 1 o'clock, 5 o'clock, or whatever. These clock positions are in a PNG file and incorporated into our reports with JavaScript."

Summing up the difference between a purpose-built field data collection platform and those available within the Esri workflow, Carey says, "If you try to

create an Esri application with, say, 173 fields of data, everything slows down. We think of it as all our detail work living in Fulcrum, with Esri giving us the summary, high-level perspective."

## Innovative integration of FieldTech tools

An exciting innovation in doing confined space inspections is the introduction of 360-degree, panoramic cameras, in particular the TREKK360 camera. A proprietary tool that TREKK has made available to customers and competitors alike, the TREKK360 can be dropped into spaces as small as 3 inches square, giving a clear, panoramic view of even the narrowest of entry points to storm inlets and underground infrastructure. The use of this camera, coupled with Fulcrum for field data collection, has fundamentally changed how TREKK performs confined entry inspections.

Carey says, "Before we had the camera, a tech would have to get on their hands and knees with paper and a tape measure to get the information we needed. Just the prep for the inspection—setting up fall protection like a tripod, a winch, and a harness, plus the OSHA paperwork—took as long as an hour for each inspection." Now, using the TREKK360 and Fulcrum, all that has changed.

"To start with, a two-person field team will go to the inspection site, and using their mobile device loaded with Fulcrum, capture the 'header' information—the ID, the location, the manhole cover size. Then they drop the camera, do a scan, and with Fulcrum, sync the data to the cloud where it is delivered back to our engineers at the office," says Carey. With that, the field team's work is done, and they can move onto the next location, while the in-office technicians get to work on the inspection using the information the camera provided.

"On the office side, our technicians take the TREKK360 data and do the 3D rendering and visuals. They bring up the visualization of the infrastructure on one monitor, and the Fulcrum app on another, and they go through the inspection app field by field, filling out the information from what they observe from the visual data collected," explains Carey.

As in the field, the Fulcrum app's conditional logic directs the inspector to collect all the necessary, relevant data, without wasting time showing inapplicable questions. "Fulcrum forces the inspector down a path. For example, is the manhole cover missing? If so, fill out these fields. Otherwise, if the cover is there, is it a good fit? Is it the right diameter? It really helps to streamline the process," says Carey.

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For the engineer performing the remote inspection of the asset using the visual data, the TREKK360 delivers incredible details that would be difficult or impossible to capture during a physical inspection. "We can zoom in any part of the pipe, find chips, cracks, and investigate any anomalies to do a comprehensive condition report. After that, we take the 3D model generated from the data and start doing the measurements—what is the pipe width, its depth, and all the other figures we need to capture," says Carey.

For the third step of this inspection process, the data goes to the TREKK GIS department, where a GIS technician will calculate the mapping component of the information gathered. "Our GIS techs deal with the routing, making sure that the north has a pipe going north, and south has a pipe going south, basically how pipe captured connects into the network around it," says Carey.

Finally, TREKK has a QC team that performs spot checks of the data collected in Fulcrum, the 3D visualization, the measurements, and the GIS data to ensure there are no errors. And when everything is ready to go, TREKK bundles all the records that have been collected and approved into one big batch, automatically generates corresponding PDF reports in Fulcrum, and delivers these reports to the client by way of FTP, email, or hard drive.

The entire workflow is not only safer for the field teams performing the work at the site, but also much quicker. "All of the individual people performing their tasks are experts at what they do, so they're able to get through their tasks very quickly," says Carey. "This efficiency saves us 30% in labor, which we're then able to pass along to our clients."

## Foolproof data collection with automatic location intelligence

Fulcrum features that have proven instrumental in ensuring thoroughness and accuracy of inspections and field assessments include automatic geotagging of all inspection records and data points using mobile device location intelligence, as well as mandatory, unskippable fields and conditional logic.

"The inspectors can't even leave the job site without getting all the data in Fulcrum the way we want it to be," says Carey. "Before, we were dealing with quality control issues of missing data, incorrect, irrelevant data, and not even being sure we were inspecting the right structure because we had no spatial component. So Fulcrum brings the latitude and longitude to everything. Every record has an x and y coordinate. If the GIS map shows the manhole's location, and you can see that you're within 10 feet on the Fulcrum record, then that must be the right manhole. It validated each record location."

## Streamlining deliverables

Leveraging Fulcrum's purpose-built field data collection platform holds many benefits for the back office too. Carey says, "At TREKK there is tremendous value in minimizing downtime, troubleshooting, and frustration. With Fulcrum we can design 'smart' inspection forms with simple drag and drop fields that include conditional logic. It's easy, and we don't need to train our staff to be programmers. We can build forms quickly in Fulcrum, without any expertise. And in addition to ensuring our field teams are consistently collecting the right data in the right format using the 'smart' inspection apps we design, we also leverage Fulcrum to automate turnkey reports we include in our GIS deliverables."

## The right technologies, the right results

By using the right complement of technologies including Fulcrum for field inspections and data collection, Esri for GIS, and now with added innovative capabilities including TREKK360 imagery, TREKK continues to break new boundaries in providing quality and efficient services to its municipal clients. Combining the power of these technologies has almost doubled TREKK's field progress while eliminating "clean-ups." Carey explains, "Let's say our traditional inspection methodology would support 15 manhole inspections in a day. Modern methodology combining Fulcrum and Esri with the 3D camera supports up to 30 inspections. We used to have to dedicate one of our teams roughly one day per week for field clean-ups, where we're sending teams back to reinspect field assets due to missing or unclear data. Now we can perform these in the office on the fly using inspection data in combination with the power of 3D models."

## Looking to the future

Carey concludes, "In addition to providing comprehensive engineering design and consulting services, TREKK also strives to provide technology offerings that help its clients work smarter. And in the last five years, I've seen more explosive growth, technology adoption, and innovation than ever."

The technology providers TREKK relies on also don't stand still. Fulcrum has licensed Esri's Runtime software development kit to deliver seamless integration between the Fulcrum field data collection platform and Esri ArcGIS. As a result, customers that need to build, deploy, and manage complex field inspection applications can have real-time, seamless bi-directional data integration between Fulcrum and ArcGIS. The result? TREKK is better able to stay on track and on schedule, delivering client solutions that empower communities and improve lives.

"This is a game changer for our organization," says Carey. "We depend on both Esri and Fulcrum to deliver an accurate and comprehensive view of field assets and utility operations to our clients. For our field teams, the source of truth is their Fulcrum mobile inspection apps—but they need to include data, maps, and functionality from Esri to enable our teams to work at peak effectiveness. This new integration will dramatically improve current operations while also opening many additional use cases for TREKK and our clients."

## Ready to integration your utilities inspection data?

The Fulcrum field data collection platform plays well with others, making your other applications more powerful, your decisions more informed, and your field operations more effective. **Reach out for your custom demo** and get started today!