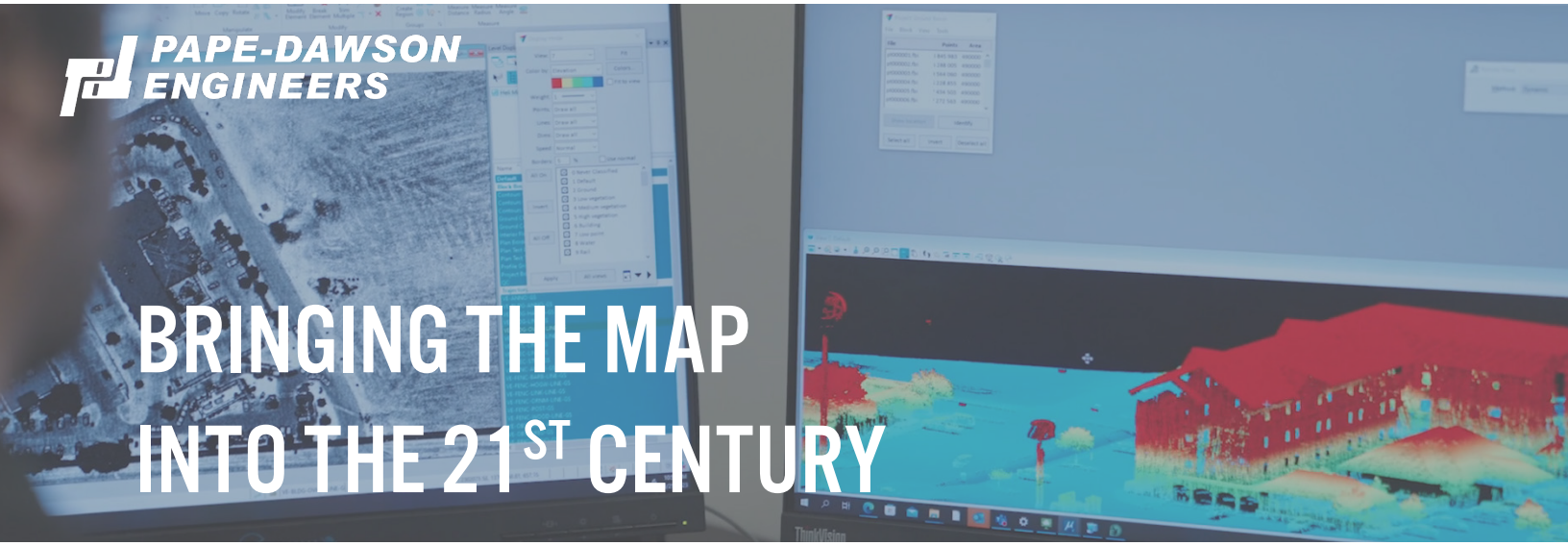

PAPE-DAWSON ENGINEERS

BRINGING THE MAP INTO THE 21ST CENTURY

by Pape-Dawson Engineers **MAY 2023**

When's the last time you used a paper map?

It's probably been a while. The worlds of surveying and engineering are moving in the same direction—away from paper and pen and towards screens and highly detailed 3D models.

True, some practitioners still prefer to look at a 2D paper product. "I like to see a paper map," admits David Casanova, RPLS, Senior Vice President, Land Surveying, at Pape-Dawson Engineers, Inc. "I can take out my red pen and mark it up. But the younger generation can do the same thing on a screen because of the way they were brought up and trained."

Despite his preference for paper, David embraces the advances in engineering and surveying already achieved by modern technology. For example, today's Lidar (Light Detection and Ranging) scanners can produce accurate maps with astounding speed. Pape-Dawson's drone- or aircraft-mounted scanners can glean more data in a day than a human survey crew would be able to record over several weeks.

The need for on-the-ground surveying will remain, affirms Pape-Dawson Vice President, Geospatial Services, Angela Livingston, CP, CMS-Lidar, GISP. "We always confirm our accuracy by putting crews on the ground to set control for us." Traditional survey crews continue to take measurements of known points that are more precise than remote sensing can get. "We bring our scanned data down to the earth on the basis of those known points collected by real people." Boundaries, property corners, and other survey items remain the purview of in-person survey crews, too. "A drone can't see through a manhole cover to see pipe inverts," says Angela. The true value of the technology is not in replacing personnel, but in conserving them, David explains. "We don't have to devote our field staff to those three-, four-, or five-week projects. We can cut those timelines down with Lidar or another scanner. We need the actual crews for only a fraction of that." That's a powerful plus in today's job market, where the need for surveyors and engineers outpaces demand.

Lidar's reach will soon grow far beyond mere topographic details, says Angela. "We're really interested in applications that go beyond just 'What's the elevation here?' We can put a Lidar scanner down a pipe to discover cracks, for example, or map a roadway to determine the quality of the surface." In the near future, she expects the use of scanners in interior spaces to increase – to map water treatment plants, pipe rooms, sink holes, historical structures, and more.

Scanners also inform data-rich, 3D virtual models that influence design. A paper map exists only on the sheet; though you can copy it, it can be extremely difficult to manipulate in three dimensions. Lidar scanners, however, record the real world and allow you to import it into the virtual world so you can design around it. Far from making a conceptual model from scratch based on the characteristics of the world, building information modeling (BIM) creates a digital twin of the existing landscape or structure directly from the empirically measured

data, allowing engineers and others to study it and design around it. By employing artificial intelligence (AI), the BIM model can also perform other important functions such as clash detection. In an instance when architects or engineers are planning a building addition, the model can find where proposed modifications (air ducts or water lines, for example) conflict with in situ components.

Applying AI to Lidar scans results in even more-powerful information for the architects, engineers, and others, says Angela. "Change-detection technology can tell the difference between scans taken at different times, so you can determine the scale of damage from a natural disaster based on the before-and-after pictures." AI has also honed its ability to not only record what the scanner sees, but also identify discrete details by material (wood, soil, pavement) and even function. "The technology can even identify particular parts," adds David. "You can not only see what part of the pipe has malfunctioned, but you can also find out the manufacturer and part number so you can order its replacement."

The key for the near future will be an active commitment to learning and adapting to best practices, which will certainly change with advances in technology. "We have a whole toolbox of really high-end equipment to use," says Angela. "The trick," continues David, "is finding the combination of conventional and high-tech approaches that works the best."