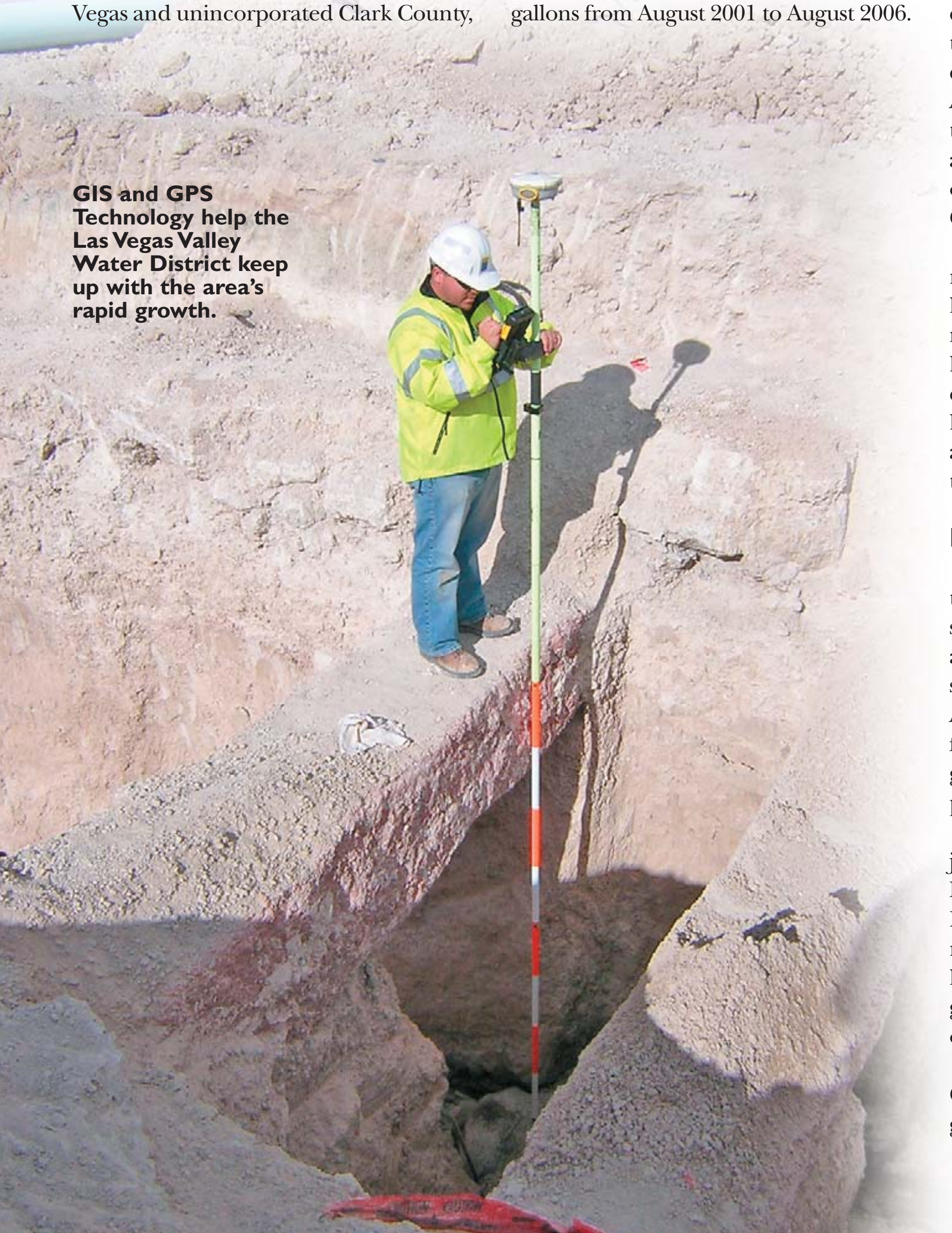
BETTING ON TECHNOLOGY

The Las Vegas Valley Water District handles growth and enhances staff efficiency with early and aggressive use of GPS and GIS

By Angus W. Stocking

The Las Vegas Valley Water District (LVVWD) faces the dual challenge of keeping up with rapid residential and business growth and keeping service reliable for high-value customers.

The district serves the City of Las Vegas and unincorporated Clark County, one of the fastest-growing metro areas in the United States. The district is adding 1,300 new accounts per month and provides water to about one million users. To keep up, the district itself has to grow rapidly. Public information coordinator Kristen Howey notes that storage capacity increased by 131 million gallons from August 2001 to August 2006.



GIS and GPS Technology help the Las Vegas Valley Water District keep up with the area's rapid growth.

Pressure to perform is also intense: The Las Vegas strip is one of the world's most efficient money collection systems, and supply interruptions in the hotels and casinos is not an option. In the city's desert environment, water is at least as critical as power for those businesses.

These challenges have forced the district to be among the most innovative anywhere, and that is especially evident in its use of GIS and GPS systems. As an early adopter of the technologies, the district created protocols as it went along, in the end programming much of its own software and building its own GPS base station network.

The benefits to customers are significant — LVVWD has been able to keep up with growth with far less investment in staff than expected, and service has improved. Rates are lower than they could be too: The efficiencies gained by high-tech innovation are documented, and the installed systems have paid for themselves many times over.

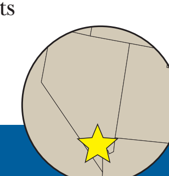
Built from scratch

As in many new GIS implementations, the LVVWD project got off to a slow start. Database design and data acquisition began in 1995, but demonstrable results were still a few years off. And at that time, district personnel had few models: They were breaking new ground. "There were definitely growing pains." says Howey.

In 1997, when Jonathan Pickus joined the staff as Automated Mapping/Facilities Management/GIS Division Manager, the first products were beginning to emerge. "The district was not happy with the expense in the early going, since there wasn't a lot coming out," he says. "But I knew it would work."

Pickus realized first of all that the GIS had to work. The water system's growth was almost unmanageable with conventional methods, and his division was falling behind. There was a three-year backlog in preparing as-built plans, about 750 projects, and as many as 100 projects were being added each month.

Standard data collectors are paired with office automation to generate digital map data for the GIS.



PROFILE:

Las Vegas Valley (Nev.) Water District

FOUNDED:
1954 (start of operations)

CUSTOMERS:
325,000 accounts (more than 1 million people)

AREA SERVED:
31 square miles

WATER VOLUME:
315 mgd (2006 average)

INFRASTRUCTURE:
35 reservoirs (800 million gallons), 32 pump stations, 3,500 miles of distribution pipe

WEB SITE:
www.lvvwd.com

Field Automation and standardization provide high quality and efficient data collection.

Similar stress affected the creation and maintenance of engineering record drawings. Mapping was being done by a mix of digital and manual methods, and about 2,400 paper maps required updating. "It was pretty insane," says Pickus. He identified mapping as a good starting point for GIS automation.

Automated mapping

The district maintained its original database design, but GIS staff built layers of automation that would create and maintain maps with little human input after data collection. Their main tools were Oracle and Visual Basic.

"Using GIS people to draw maps is not the best use of resources," says Pickus. "They should be focused on automating processes." As manual drafting disappeared and digital maps began to automatically incorporate database information, the division's backlog went away. The automation also reduced redundant data entry and improved accuracy.

The next step was to integrate computer-aided drafting (CAD) and GIS more tightly. As the CAD staff produced as-builts, GIS data was automatically updated, and business and engineering data were incorporated. For example, account information and water pressure data were attached to parcels and facilities.

Data accuracy was looked at next. Previously, as-builts and other spatial data relied on hand-measured sketches, often referring to features like curbs or buildings that could change or disappear over time. The increasing relevance and usefulness of the GIS, called for survey grade accuracy on a coordinate system.

The district equipped field crews with GPS receivers and developed practices to standardize data collection. For example, meters and valves were photographed and made into a manual that showed where and how to take readings. Applications were built to incorporate GPS data automatically and generate as-builts and vector data for the GIS.

Multiple benefits

The system worked so well for as-builting that other work groups began to participate. Inspectors collected GPS points and, in return, automation was applied that generated digital redline markups. That task, normally performed by inspectors, was made more precise and served as source input for as-builts and the GIS. This greatly eased time pressures for inspectors and raised the GIS profile in the district.

Facility locators, supporting "Call-Before-You-Dig," also benefited greatly from GIS and GPS. Using wireless-

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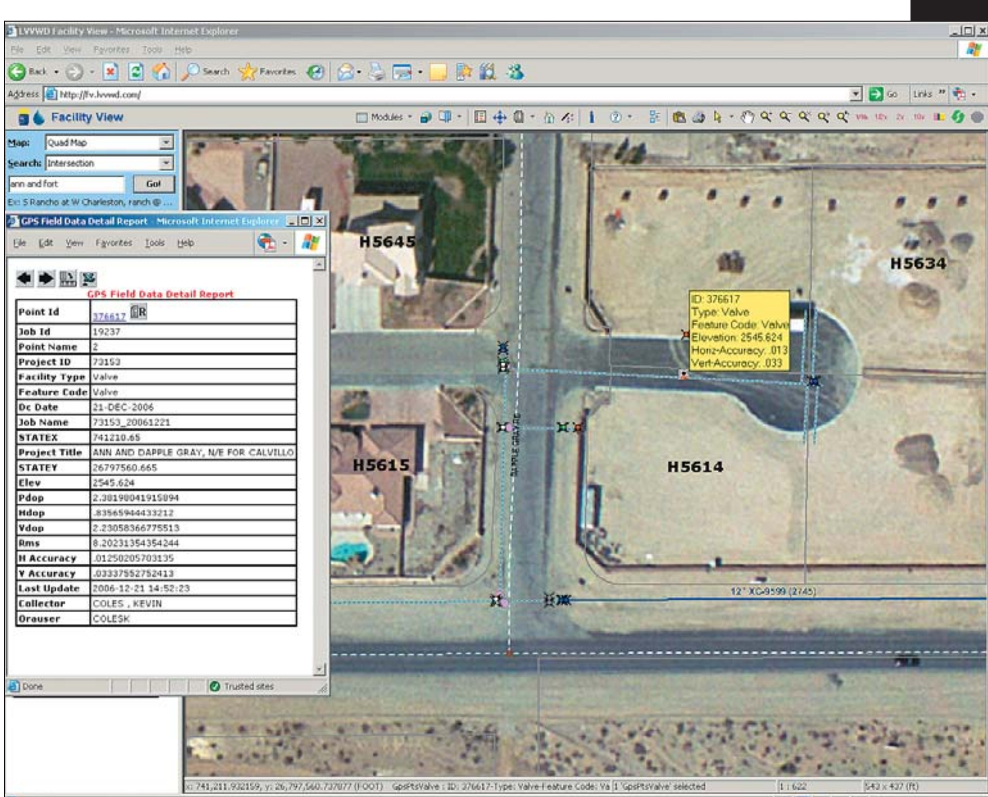


Detailed web-based maps like this are one reason the Las Vegas Valley Water District seldom produces paper maps.

EXPANDING A SUCCESSFUL GIS

In late 2006, the Las Vegas Valley Water District and Autodesk Inc. announced jointly that the district had selected Autodesk Topobase software to extend the capacity of its legacy GIS.

Topobase software is open protocol, meaning it works with a variety of data types and lends itself to extensive customization. This was important, as the district had spent countless hours creating a highly customized system that worked well. The GIS didn't need replacing, it needed augmentation.

"Autodesk Topobase complements our existing enterprise systems, including ESRI ArcSDE, and allows linkages with Hansen asset management and PeopleSoft with a single interface," says Jonathan Pickus, the district's Automated Mapping/Facilities Management/GIS Division Manager. "Within five months, we were able to incorporate the software into our system."

Topobase data management systems allow many users to access spatial data without overlapping each other or entering data redundantly. The district staff also found it to be a good tool for maintaining and verifying spatial accuracy.

Autodesk has embraced open-source GIS. The company is a sustaining sponsor of the Open Source Geospatial Foundation (www.OSGeo.org) and has released the source code to its product, Map Guide Open Source, to developers to modify and extend.

In 2006 alone, developers downloaded 23,000 copies of Map Guide Open Source. Autodesk has also adopted an agnostic policy for data types, so that users like LVVWD can confidently incorporate Autodesk software into existing systems.

"Spatial data is becoming just another data type for the IT guys to keep track of," says Chris Bradshaw, Autodesk vice president of Infrastructure Solutions. "Proprietary software and data formats just shrink the market."

enabled laptops and GPS receivers, locators doubled their efficiency in four years without adding staff. Since the district performs all the one-call locates for its facilities, this was a significant savings.

The department largely eliminated a cumbersome system that relied on faxes, physical copies of maps, several trips to the office each day, and physical measurement. Staff developed applications that automatically interpreted location requests and generated tickets for transmission to crews in the field.

The staff loaded laptop computers with regularly synchronized digital maps of district facilities that gave criti-

"We were the first in this area to have such a network, and it's state-of-the-art. It's a very complete system and is probably one of the top ten in the nation for a district like ours."

Skip Harness

cal coordinates. GPS receivers now find the coordinates with high accuracy. The system continually improved as the staff incorporated more engineering information, such as pipe sizes, into the maps.

"This all saved time," says Pickus, "and it was also good for risk management, as all communications were automatically stored."

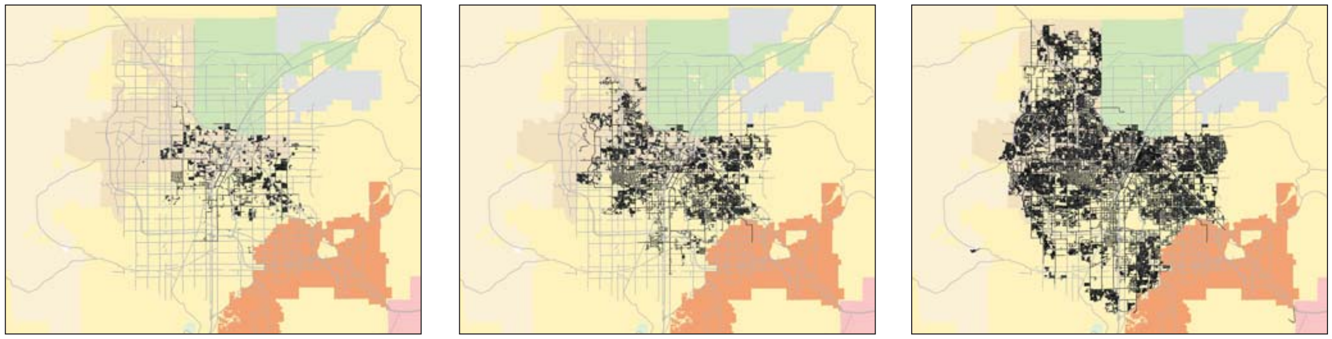
Automated mapping remains a major component of the district's GIS success story. With the help of an automated labeling system and improving standards for field crews, the district produced more than 6,000 maps in 2006.

This would have been impossible without automatic mapping systems, which nearly eliminated conventional CAD drafting tasks. Maps rarely need to be printed out, either for storage or reference. Pickus reports that 450 district staff members access map information from the GIS over the web monthly, or take digital copies of maps for use in the field.

Innovative GPS

The district established its first permanent GPS base station in 1996 and now has six, plus shared-use agreements with surrounding jurisdictions that incorporate three more, completing a network that thoroughly covers the service area.

"We were the first in this area to have such a network, and it's state-of-the-art," says principal surveyor Skip Harness, a state-licensed land surveyor and water



A map series shows the steady expansion of the district's distribution pipelines. From left, 1970, 1990, 2006.

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The base station network is available via conventional radio, the wireless laptops, and the Internet. With radio alone, GPS horizontal accuracy drops off with distance from the base station at 2 millimeters per kilometer for every kilometer over 10. Vertical accuracy drops off even faster.

This was a problem, as the district requires high accuracy, especially for vertical location of reservoirs, subsidence monitoring, and other tasks. But the dense network combined with Internet adjustment overcomes that limitation. Harness is confident that he is getting good data everywhere in the district.

There are seven people in the survey department, three of them regular field personnel. That's not enough for all the data that needs collecting, so several departments have rededicated personnel to GPS field work. Harness finds that training requirements are minimal — it takes as little as two 2-hour sessions to get users up and running. GPS efforts have paid off: The district collects an average of 215 data points per working day, and they automatically upload to the GIS.

Big savings

The district's staff was not substantially affected by the move to automated mapping and increased reliance on the GIS. "No jobs went away," says Pickus. When managers saw the potential payoff in efficiency, the location, distribution and inspection divisions were willing to reallocate staff to collect data. After some initial reluctance, staff proved willing to retrain: For example, manual draftsmen became digital draftsmen who now directly manage GIS information.

The savings have been real. Comparative analysis is always difficult, especially when the workload is accelerating even as changes are being implemented. But Pickus does have some hard figures. For example, the division now offers more services, such as custom mapping, operating a heavily used web-based GIS system, and developing automation that supports the needs of other work groups, without adding staff. Pickus estimates savings from more efficient processes at $250,000 annually.

Similarly, the facility location work group moved personnel out of dispatch, which was now automated, into other duties. The department completed more locates, more efficiently, and Pickus estimated annual savings of at least $150,000. That is in addition to greater accuracy and fewer errors — mitigating liability issues.

Future directions

Once a functioning GIS is in place, its uses expand as more users see the advantages. One future possibility is maintenance scheduling. "If we can get enough engineering data in there, like soil types and historic failure information, the system could be used to help predict when scheduled repairs and replacements are needed before actual failures occur," Pickus says.

Such systems are becoming routine for manufacturing plants and other facilities, but the details are still being worked out for large utilities like the LVVWD.

Even without future expansion, the current system is a huge win. Faced with record growth in an already huge metro area, district staff went for a big technology fix that ended up doing all they had hoped for, and more. Sometimes it pays to gamble. ✦

MORE INFO:

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Autodesk
800/964-6432
www.autodesk.com

Field staff have access to the district's GIS and infrastructure information using wireless technology.