Putting Your System on the Map, Part II

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In the last issue, we discussed a few of the specifics about what a geographic information system is and how it works. We also went over global positioning systems. In this issue we will discuss how the two components work together to give the user a product that is crucial in planning for the future of the water system as well as efficiently managing their day-to-day operation. The focus of this article will be the data collection and mapping of a small city water or sewer system. The methods and principles discussed may also be utilized in storm water, parks and recreation, emergency response and planning and other municipal functions. The only real limitations are your imagination and pocket book.

A geographic information system is comprised of two basic components. The first is the database that contains the information. The second is the physical representation of the database information, i.e.: The layered map of your city.

I recently spoke with an engineer that provided one of his clients back east with a comprehensive GIS system for a fee of $83,000 for a city of 21,000 people. What he provided might have been exactly what the city administrators asked for but was it what the city needed? That question is for each user to determine. Some cities may need something that extensive; while others may need a system that is simple enough yet complete enough that, they can compile the information and put it on the map themselves.
So the next logical question is: HOW?

There are several software packages available out there, including *GBA Water Master®, WaterMap, Manifold® System* and many others. The trick is to get the right software for your specific application. With a little planning and a lot of research, you should not have too much difficulty in finding the product that is perfect for you. I find it helpful to sit down with someone on your staff, preferably someone familiar with your city, which will also be using the software. Go over all of the layers (pipelines, valves, etc) you would like to see on your map. Discuss the horizontal and vertical accuracy you will need. For example, do you need to be plus or minus a matter of feet? Inches? Centimeters? Whatever you decide on, the mapping software you choose should allow you the ability to easily interface with a method of data acquisition. The method of data acquisition on which you decide is also greatly dependant on the degree of accuracy you wish to see and the amount of money you can spend. The price for a GPS receiver can be anywhere from $200.00 all the way up to around $100,000.00 for a GPS Total Station. For this application, I would recommend something in the $5,000.00 range. If you choose to start out with something a bit less expensive, make sure that, the unit you choose utilizes the “Wide Area Augmentation System “(WAAS). You've heard the term WAAS, seen it on packaging and ads for GPS products, and maybe even know it stands for Wide Area Augmentation System. Okay, so what the heck is it? Basically, it's a system of satellites and ground stations that provide GPS signal corrections, giving you even better position accuracy. How much better? Try an average of up to five times better. A WAAS-capable receiver can give you a position accuracy of better than three meters, 95 percent of the time. In addition, you don't have to purchase additional receiving equipment or pay service fees to utilize WAAS. The Federal Aviation Administration (FAA) and the Department of Transportation (DOT) are developing the WAAS program for use in precision flight approaches. Currently, GPS alone does not meet the FAA's navigation requirements for accuracy, integrity, and availability. WAAS corrects for GPS signal errors caused by ionospheric disturbances, timing, and satellite orbit errors, and it provides vital integrity information regarding the health of each GPS satellite. Although WAAS has not yet been approved for aviation, the system is available for civilian use such as boaters and recreational GPS users. WAAS consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on either coast, collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites, or satellites with a fixed position over the equator. The information is compatible with the basic GPS signal structure,

which means any WAAS-enabled GPS receiver can read the signal. What this means to you is, you can have a product that is relatively inexpensive that will give you a map accuracy of less than three meters. The question than is, “how close is close enough”. In a city environment, you may have a couple of water meters, a manhole, and a storm drain in a three-meter area. If this is the case for you, the next step up to a $4,000.00 handheld receiver may be your best bet.

OK. Now the hard part is done. You have the software and the receiver, now its time to start accumulating data. The only tricky part, once you have reached this stage is to collect and download the data in a manor that allows you to view each category in a separate layer. If you are trying to determine capacity development in a specific area of your water system, this will allow you to view only the information that is pertinent to the task at hand. If you are having trouble doing this, consider collecting and downloading the data in blocks. For example, collect GPS coordinates for all of your tanks during your daily rounds. The next day, collect data on your pumps and so on. The most cost effective way I have found to plot water/sewer/storm drain transmition lines is to plot the valves or manholes and play dot-to-dot. This will not allow for lateral variance but it should give you an adequate degree of accuracy.

If you have questions about how to get started, please call the office at (503) 873-8353. I would be happy to come give you a hand.