Has the World Become a Smaller Place?

By Shawn Stevenson, Source Water Specialist

Perhaps the need to know how to represent and recreate a specific area has as much to do with mastering one's surroundings as it does with navigation. Mankind's representative understanding of his environment is a task that dates back farther than the recorded written word according to historians. What I am referring to is a graphic representation of geographic features, which in simple terms is called a map. A map can represent many themes, but one element which is often ignored is that each map is a window to a particular time whether it is the past, present or future.

Today's maps are at a level of an accuracy detail that was unimaginable just a few short decades ago. To discuss the progression of map making and what it means to us on a daily basis would be an injustice without looking back into the past through history and noting the benchmarks of progression of both technology and early cartographers. Some of the oldest known maps are on Babylonian clay tablets that date back to (2300 B.C.) and throughout history early cartographers made incredible technological strides. Cultures such as ancient Greece and the Chinese pioneered many scientific techniques. The notion of the Earth being a spheroid was known throughout the Greek culture and was furthered by its philosophers; by the time of Aristotle (350 B.C.) it was accepted as fact by the majority of geographers.

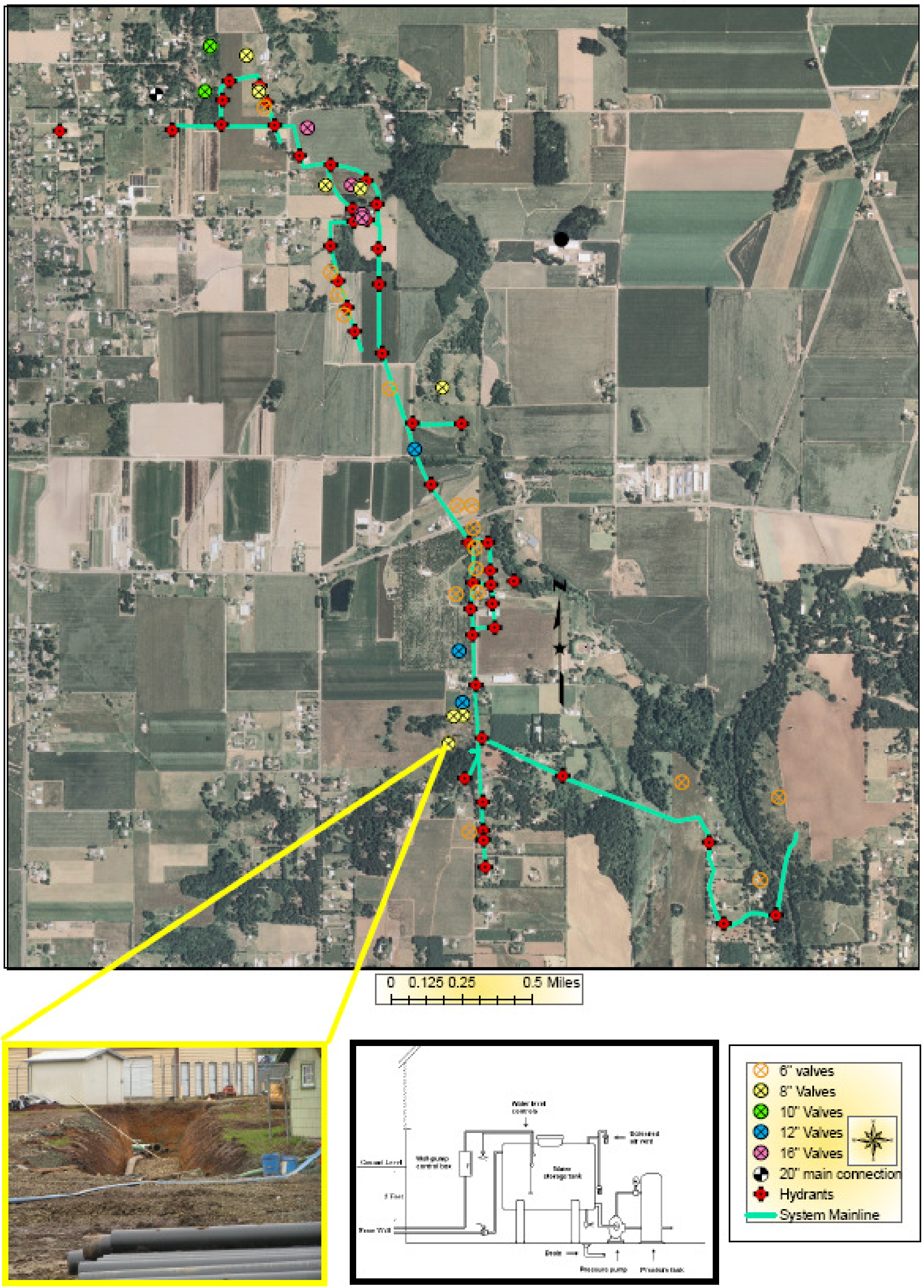
However, there was somewhat of a backlash in scientific practice and the belief that the earth was flat potentially slowed mapping progress. It is an argument for the ages whether the majority of Renaissance European society really accepted the flat Earth theory. But one opportunistic explorer in 1492 looking for the West Indies proved that a round Earth existed; although partially by accident. The realization of a round Earth made an extensive problem for cartographic representation evident. To display something on a flat surface of a map that is originally round presents multiple problems. In larger scale (smaller zoomed area map) this may seem somewhat trivial but in actuality the need to use the proper map projection is paramount for accurate placement of landmarks, public utility assets as well as alignment issues with various field data.

In general terms any particular map is by no means a perfect model or representation of any specific place; regardless of the scale and or level of detail a map will always have inherent errors associated with it. "No map can depict <u>all</u> physical, biological, and cultural features for even the smallest area. A map can display only a few selected features, which are portrayed usually in highly symbolic styles according to some kind of classification scheme. In these ways, all maps are estimations, generalizations, and interpretations of true geographic conditions *(ES 551 © J.S. Aber, 2004).*" These so-called imperfections can range from errors in field observations to distortions associated with projections and coordinate systems. Keep in mind that every map projection will distort distance, direction and or shape in some combination. Although this sounds very ominous it is an accepted fact and therefore is taken into account when a projection is chosen.

Skipping ahead the next logical progression in the realm of mapping took place in the later stages of the 20th century. Geographic Information Systems (GIS) by definition is a collection of computer hardware, software, and geographic data for manipulation and display. One of the primary pioneering companies in GIS is ESRI; a self proclaimed definition states "founded as Environmental Systems Research Institute, Inc., in 1969 as a privately held consulting firm that specialized in land use analysis projects." Today they are the world leader in GIS software and corner the market with several variations of ArcGIS software suite.

Presently one very practical approach to modern day mapping is the integration of Global Positioning System (GPS) measurements. GPS is a satellite based positioning system which uses multiple satellites to triangulate an object or vehicle location on the surface. Originally designed by the government for defense purposes the satellites became available to all users in the 1990's under the basis of commercial air travel. With that door being opened, many new tracking and mapping platforms were spawned and made available to the public. GPS data can be incorporated into the GIS system to produce an almost infinite variety of thematic maps. The ability to take field observations at meter level or sub-meter for commercial grade Global Positioning System (GPS) units and then transfer those measurements to a base map is an invaluable tool.

Water System X Component Location Sample Map



Many water systems throughout our state are staffed by competent individuals who know their water system like the back of their hand. But if they are injured, sick, or unable to perform their duties due to a crisis; does the next person have a clue where key components of the system are? Now some might view this as job security but in reality it can put the water system assets and potentially customer's lives at risk. Many systems suffered flooding this past winter and required help. It became obvious to some water systems that just one informed individual can't do it all in a time of crisis. Accurate maps serve many purposes besides being worth there weight in gold during an emergency. Usages such as retrofits, repairs, and general maintenance to name a few are all worthy of noting. Having the specific locations for components in a public utility system can be paramount; anyone whom has ever had to look for a valve location in adverse weather conditions or an overgrown area during an emergency can testify to this.

With the integration of GPS into the GIS software OAWU has the ability to create comprehensive water system maps at various levels of detail. Take for example the Water System X Component Location Sample Map. In this case the system diagram includes line diameters, valve locations, and hydrant locations. Some worthy additions would be meter locations and linked as built drawings of specific areas that require more detail. The base map can also include street names and addresses, along with a topographic or aerial photo base and Computer Aided Design (CAD) layers. Water System X was a fictional example to avoid any legitimate security risks!

There is a significant difference between knowing the approximate vicinity of something versus the actual location. As-built drawings are beneficial but not always 100% accurate to changes made in the field. Diagrams, pictures, or any technical information can be included digitally or on hard copies as a window or hyperlink to add focus in certain areas.

Has the world really become a smaller place? Figuratively speaking GIS technology can definitely close gaps in information. What was once the frontier is now just a click away. The future will hold several innovations in terms of mapping and most assuredly 3D imaging is a portion of that equation. There are multiple water systems throughout the state that will benefit from self study and verification of system asset locations. OAWU's Project Management Services Division can help your transition into the future through training, GPS location and GIS water system mapping services. The future has arrived so welcome to it!

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