

# Photogrammetry Helps GISers Overcome Challenges of Island Life



▲ County employees conduct ground control survey in support of the 2008 orthophotography project.

It's easy for people to take for granted the convenience of location information. Our minds are chock full of it. We drive to work, school, or run errands every day with knowledge of where we are going and an internal clock that tells us how much time it takes to get to a particular destination. If we are unfamiliar with our destination, internet mapping tools using geographically-based data provide a very useful convenience to determine route, distance, and travel time. In addition, government organizations such as emergency response and law enforcement rely heavily on precise location data to serve the general public. When information like this becomes such an integral part of our everyday lives, it is easy to overlook the amount of work required to provide accurate and reliable geographically based, or geospatial, information.

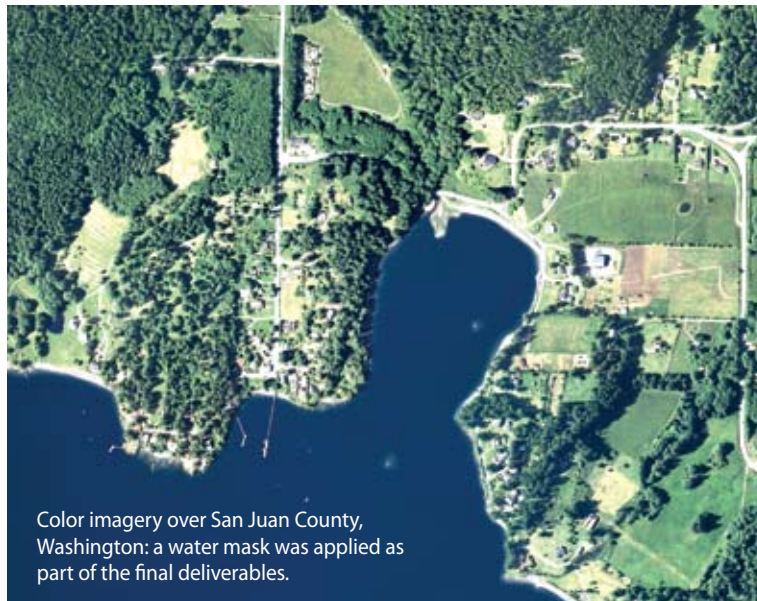
Now consider living in a community comprised mainly of islands that is more than 70 percent water. How would that affect your personal internal bank of location information? What would it be like to build and maintain the geospatial information that supports a community with this type of geography? This is the situation for the GIS team of San Juan County, Washington.

San Juan County is located off the coast of Washington State and is comprised of 176 islands. The total area of the county is approximately 620

square miles, of which 175 square miles is land and 445 square miles is water. The four largest islands—San Juan, Orcas, Lopez, and Shaw—are served by the Washington State ferry system, which is the primary source of transportation among the islands for the county's approximately 16,000 residents. If you are familiar with geospatial data and can picture this type of geography, you may begin to understand the challenges that exist in trying to maintain and provide accurate geospatial information for this community.

County staff rely on boats, small planes, and the ferry system to travel among islands to collect data in the field. Traveling among the islands is time consuming, and getting around smaller islands is difficult without a car. Collecting GPS data can also be difficult at times due to the dense tree cover and poor satellite reception. With these challenges in mind, San

Juan County is executing a plan to use advances in geospatial technology to provide reliable information to its residents.



Color imagery over San Juan County, Washington: a water mask was applied as part of the final deliverables.

## GIS Component

In July 2006, San Juan County hired its first GIS program coordinator to develop an enterprise geographic information system (GIS). At that time, the existing data sets were not conducive for an enterprise system, so the coordinator's initial task was to clean up the GIS data library.

The next challenge was software. The county uses ESRI software products for managing its data, and in order to implement the enterprise GIS all departments had to be migrated to the same version of software.

Communication and coordination has also been an important part of their plan. The majority of 2007 was spent training employees and educating the county and public about the value and power of a GIS as well as updating critical datasets. In January 2008, San Juan County secured an ESRI Small Government Enterprise License Agreement (ELA). The ELA allowed the GIS team to distribute GIS software to more employees and provided

them with additional analysis tools through a variety of extensions. Most importantly, the ELA made software available to an organization that would not have been able to afford it otherwise.

## Aerial Photogrammetry Component

Another important piece of the county's plan to provide accurate geospatial information was to update their aerial imagery dataset. The previous orthophotography was acquired in 2004 at a pixel resolution of 18 inches, but it did not offer the necessary quality for supporting the current needs of the county. In 2008, the county contracted MJ Harden Associates to acquire and deliver color digital orthophotos for the entire county. MJ Harden had already successfully delivered recent orthophotography projects for other counties in the state of Washington and was very familiar with the unique weather patterns of the area that can be problematic when collecting aerial imagery. Coordinating the ground survey and flight planning activities between the county and MJ Harden played a key role in the success of the project.

With a project area that covered multiple islands and very dynamic weather patterns, establishing good ground control would be an obvious challenge. The county established GPS control points in 1992, but unfortunately many of the points have disappeared due to construction (being placed on private property) or vegetation growth. Because of this impact, the county had to address the condition of its control network, and within the last year, the county survey-

or started reclaiming existing points and improving the density of the network.

For a typical orthophoto project, target locations would be set near the image acquisition date to avoid deterioration and disturbance. However, targets for this project were set well in advance of the imagery acquisition due in large part to the logistics of traveling to the far reaches of the county. In all, 39 control points were established, consisting of existing monuments and new control points.

MJ Harden captured more than 2,500 frames of digital imagery in June 2008 using its large format, frame-based Intergraph Digital Mapping Camera. The individual frames were orthorectified and delivered as more than 450 orthophoto tiles that were incorporated into the county's GIS. The new orthophoto dataset provided a dramatic improvement in terms of quality from the previous imagery and is a solid foundation for updating other GIS data layers.

## Data Uses

The new six-inch resolution orthophotos have provided tremendous benefits to the county's GIS team. One of the most critical functions of the GIS team is to provide accurate maps for E-911, but due to the challenges of mapping the small islands, many of the county's outer islands do not currently have addresses. The new imagery is supplying the GIS team valuable information for locating and accurately mapping roads, driveways, and buildings. The Public Works Department is using

the imagery to determine roadway characteristics, such as striping, road type, road width, and to some extent, road sign inventory. Law enforcement and the Assessor's Office are using the imagery for investigations or to verify the existence of structures for tax purposes. Overall, the new orthophotography is providing necessary detail to produce accurate representations of the county's features on the ground.

This year the GIS team will continue to build on their 2008 accomplishments by going live with their ArcGIS Server Internet Mapping application, called Polaris. Polaris is currently being beta tested by approximately 40 people, including staff from various county departments and professionals in the community, such as real estate agents and surveyors. Polaris will be a one-stop shop for county employees and the public by providing access to the new orthophotos and much of the county's GIS data in an easy-to-use internet format. ♣

**DAL CHAPPELL, GISP**, is manager of commercial operations for MJ Harden and has 17 years of experience in the geospatial industry. He is also participating on the Sustaining Members Council of ASPRS and on the Certifications Committee for the GISCI.

**MELISSA CRANE, GISP**, is the GIS Program Coordinator for San Juan County. She has been working in the field of GIS for more than 12 years and holds a master's degree in GIS and a bachelor's degree in geology.

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