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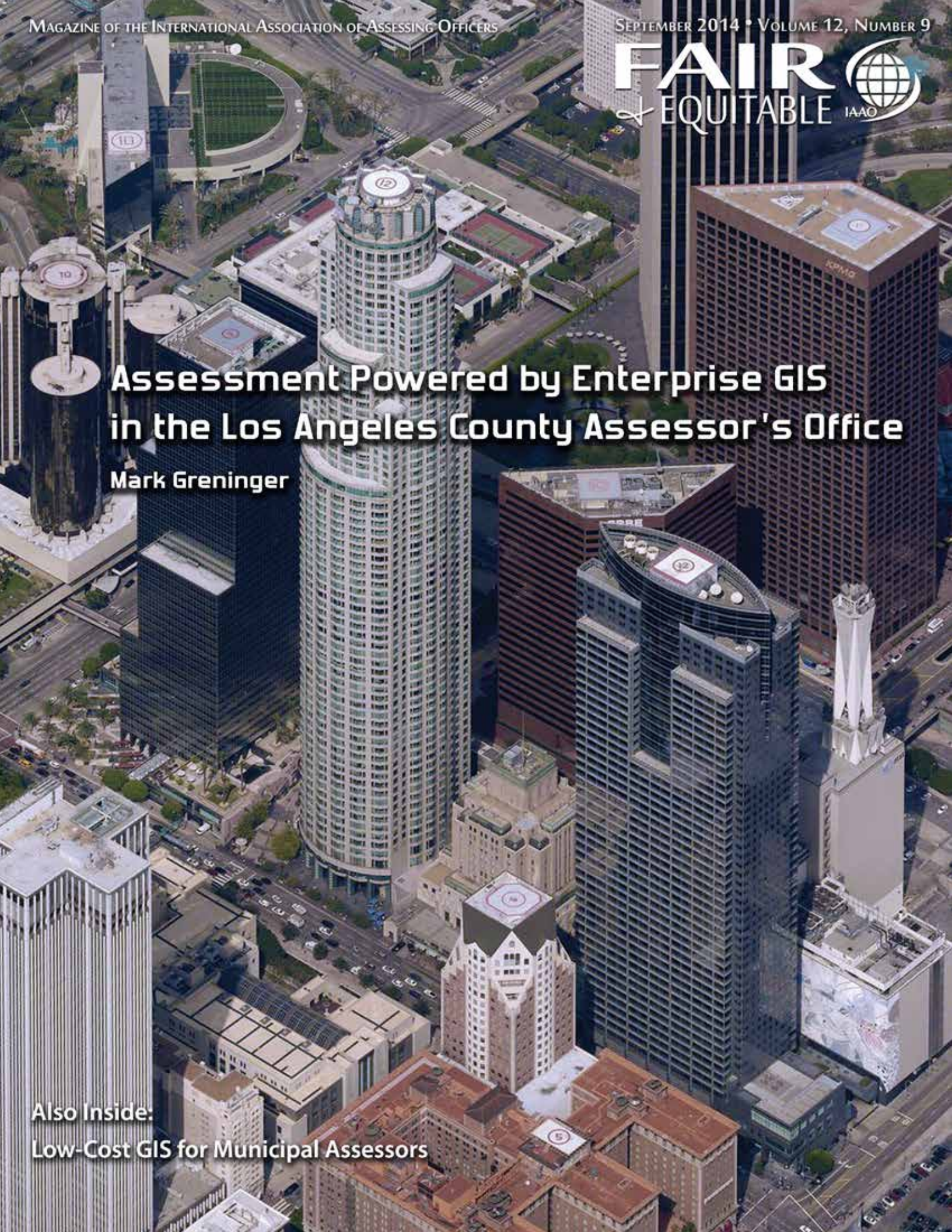

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Mark Greninger

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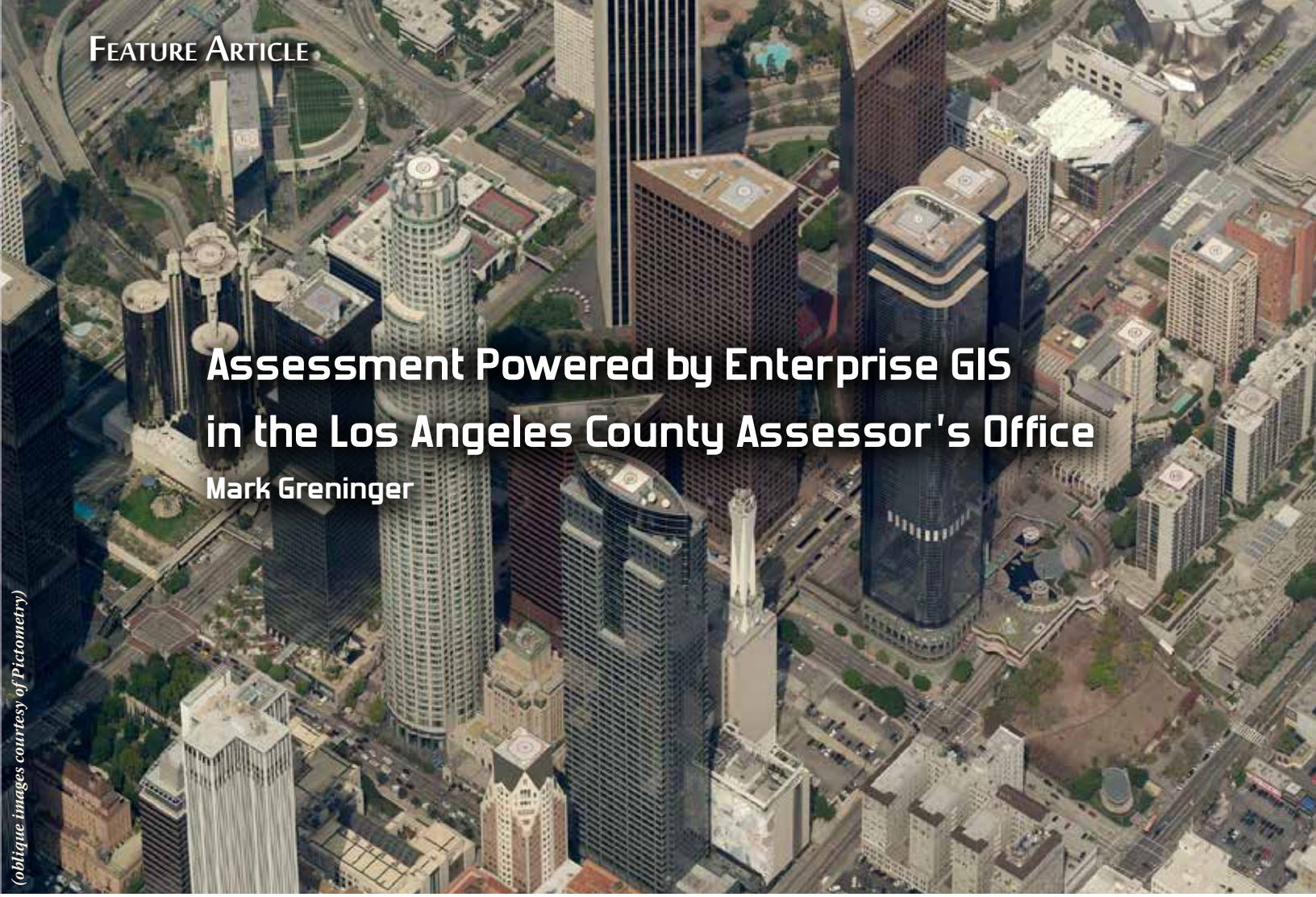
Low-Cost GIS for Municipal Assessors



Assessment Powered by Enterprise GIS in the Los Angeles County Assessor's Office

Mark Greninger

(oblique images courtesy of Pictometry)

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Assessment has always been about maps, parcels, and value, but it has moved from the paper maps, sketches, and appraisals of the distant past, to computer-aided drafting (CAD) in the 1980s and1990s, to the world of geographic information systems (GIS) today. An ongoing question through assessment offices is, "What is GIS?" The U.S. Environmental Protection Agency defines GIS as a computer system that allows users to map, model, query, and analyze many different sources of geographic data within a single database based upon location. It's a tool used by government, commercial businesses, schools, and other organizations to understand situations and solve problems.

The Los Angeles County Office of the Assessor is the largest agency of its kind in the United States, managing a property database of more than 2.6 million assessments. Leveraging GIS technologies and data has enabled the assessor's office to provide more for its constituents.

Emilio Solano, manager of Mapping and GIS Services, has been with the assessor's office for more than 25 years. In Guatemala in the 1960s, he worked on computerized systems at his place of employment, an engineering firm. Moving into the mapping position at the Los Angeles County Office of the Assessor, Solano remembers how strange it was to find that everything was still paper with no computers.

In time, Solano helped the office transition from paper maps, which required 65 engineers to maintain, to today's GIS systems, which 42 engineers use to manage the 2.4 million parcels in Los Angeles County. He has led the integration of GIS technologies, tools, and data for more than 10 years.

The Addition of Imagery

Critically, moving to a GIS world enables assessment offices to add new types of geographic information to their tool belt. One of these data types is aerial imagery, which allows assessors to see what is on the ground without having to go into the field. Thus assessors have more information before they go into the field, and in some cases, field visits are eliminated altogether, saving time and expenses. As the use of GIS grows, assessment offices are searching for solutions that fit their needs and striving to leverage enterprise-level investments in imagery, software, and tools that provide more capabilities at reduced costs.

Traditionally, aerial imagery has been captured *straight down*, also known as ortho imagery (see figure 1). However, in 2002 the assessor's office acquired a new product, oblique imagery, also known as *bird's-eye view*, which provides a more intuitive way to review property from the desktop (see figure 2). Critically, this new technology enables measurement and the overlay of existing GIS data, which had not been possible before.

The Birth of LARIAC

In 2005, the Los Angeles County Office of the Assessor was a cofounder of the Los Angeles Region Imagery Acquisition Consortium (LARIAC) program, established by the Chief Information Officer, Department of Regional Planning, and Department of Public Works. The goal of the program was to collaboratively acquire digital aerial data with organizations willing to share the acquisition costs. Many people put a tremendous amount of effort into creating LARIAC. Chief among those were Milan Svitek, GIS Manager for the Department of Regional Planning, and John McIntire, Chief Information Officer, who were able to successfully complete the first imagery acquisition. A number of other county departments and more than 30 cities immediately realized the benefits of cooperating to acquire these data for their operations.

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Figure 1. Orthogonal imagery of the new Metro Line construction in Los Angeles

Figure 2. Oblique imagery of the new Metro Line construction in Los Angeles

The assessor's office had been working on new digital and GIS-based systems, and the imagery provided by LARIAC would fit in perfectly. Computerization of parcel mapping had already begun, but black-and-white photographs were being used to help with mapping analysis. The process was laborious and expensive. As the office examined the consortium and the technology being introduced, it became obvious that this program would work, especially for property owners.

The first flights for LARIAC took place in 2006 and have been repeated every two to three years. Currently LARIAC is in its fourth data acquisition cycle (2014). The aerial imagery and data collected include 4-inch resolution orthogonal imagery, infrared 4-inch oblique imagery, 5-foot digital elevation data sets derived from LiDAR, and 2-foot elevation contours for the entire county. Initially, more than 8 trillion bytes of data were delivered on hard drives to participants. These data are accessed through desktop applications, including Esri's ArcMap software for ortho imagery and Pictometry's Electronic Field Study (EFS) application for oblique imagery. It was a good start, but installing and maintaining desktop software not only was time-consuming and expensive but also reduced participation in the project because of the complexity of deployment.

To bypass these issues, LARIAC worked closely with Pictometry over the next few years to provide faster and easier delivery and deployment models for the massive volume of information being delivered. The project team of Mark Greninger and Nick Franchino, who replaced Mr. Svitek as Project Director and Project Manager, respectively, focused on delivery speed once the value of the information had been proven.

LARIAC in the Cloud

The real change occurred when aerial imagery deployment moved to the cloud in 2010. Cloud-based services now offer all the original benefits of the desktop software but in the cloud. This development has provided access to more users, faster deployment, no configuration, no local hardware purchases, and no custom configuration. A key tool within the cloud-based platform is Pictometry Online (POL), which provides access to current and historic oblique imagery and orthophotography, as well as the ability to rapidly search and navigate through hundreds of terabytes of imagery and data (see figure 3). Users can quickly locate, display, and extract the image or portion of the image most relevant to them and easily share access to critical visual information. They can also measure, analyze, and mark up the images and maps to support their work. GIS data layers can be uploaded to POL, overlaid on the imagery, and easily shared with staff in the office or in the field.

For LARIAC members, moving to the cloud-based platform was a game changer. The consortium shifted from a data distribution model to a business services support model, whose value was more apparent and faster to realize. GIS brought all these people together, but it was the access to imagery that made it real. Early in the program, LARIAC users depended on data sets downloaded onto drives or on printed maps—a cumbersome process. As the technology shifted to the cloud, the result has been rapid, easy access to aerial imagery for everyone.

With the ability to view and download from any device, LARIAC users can access data quickly from any location.

Because LARIAC is a web-based solution, access to the data is as close as typing in a username and password (no more desktop software to wrestle with). With the ability to view and download from any device, LARIAC users can access data quickly from any location. Because the system is interconnected, information can be updated once and deployed across the entire LARIAC software platform. As an example, each week, the parcel layer is read directly as a service from the county's enterprise GIS systems. Because these data are updated weekly, all participating agencies are now working with the same accurate and current information (see figure 4).

Figure 3. POL screen with GIS enterprise overlays (parcel boundary) and additional screen usage (parcel map)

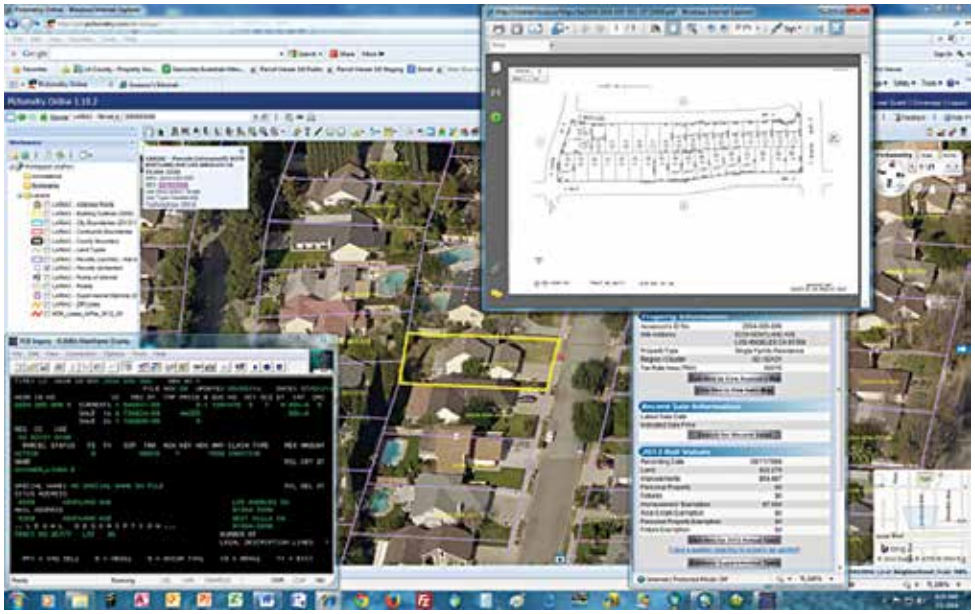
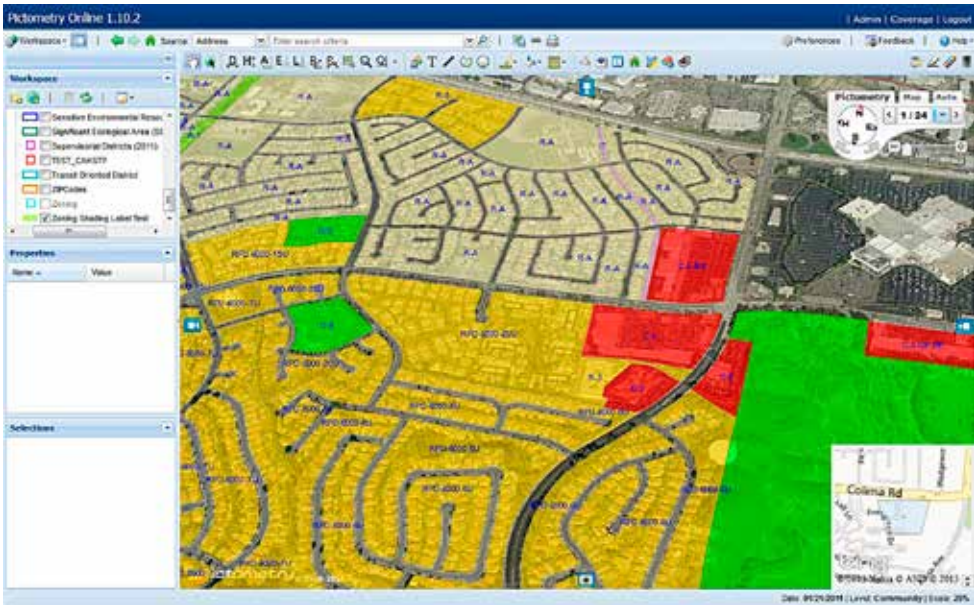


Figure 4. Parcel layer over the imagery updated weekly through GIS enterprise efforts



The value of the system shows: POL averages more than 38,000 hits per month.

Imagery in the Los Angeles Assessor's Office

Solano and his team have focused on building applications specifically for assessment from the enterprise GIS system that is in place. They have been able to provide not only mapping and surveying tools for the assessor's office but also applications for assessors in the field. The goal is to have assessors prepared with all pertinent information including imagery, history, and resale valuations.

This focus on having field assessors prepared for the field assessment has made a huge difference in productivity. The number of field visits has been reduced, and the valuable information required for assessment of places with limited access is available.

Working alongside Solano is Garo Megerdichian in the mapping and GIS department. He notes that a strong benefit of aerial imagery is confirming and defending values during appeals. The historical images are critical in the appeal process. Since California does not have any set standards, the Los Angeles assessor's office conducts inspections every year, making the historic imagery from the flights critical.

Solano's team integrates imagery with GIS applications such as Esri ArcMap. They reference imagery for mapping verification. Using the image overlay to verify position of buildings within the parcels and for ongoing development needs is very beneficial in showing what is present and, even more important, what is missing. With development professionals requesting maps and imagery, the department is confident that the information is accurate and that buildings are not being split with parcel lines. The accurate mapping is not only important to assessment but also the key to working with the public to explain updates and support planning and addressing of parcels (see figure 5).

A recent need that has arisen is the use of imagery within the tax collection department. When a city or county is putting a defaulted property up for sale or auction, it is important that the property information is correct. Cities and counties are using GIS and imagery validation solutions to save time and avoid lawsuits. Being a part of the process, the LARIAC data and imagery reduce risk and increase accuracy.

The long-term goal is to make GIS more accessible and usable for everyone in Los Angeles County by extending the GIS platform for LARIAC to include imagery.

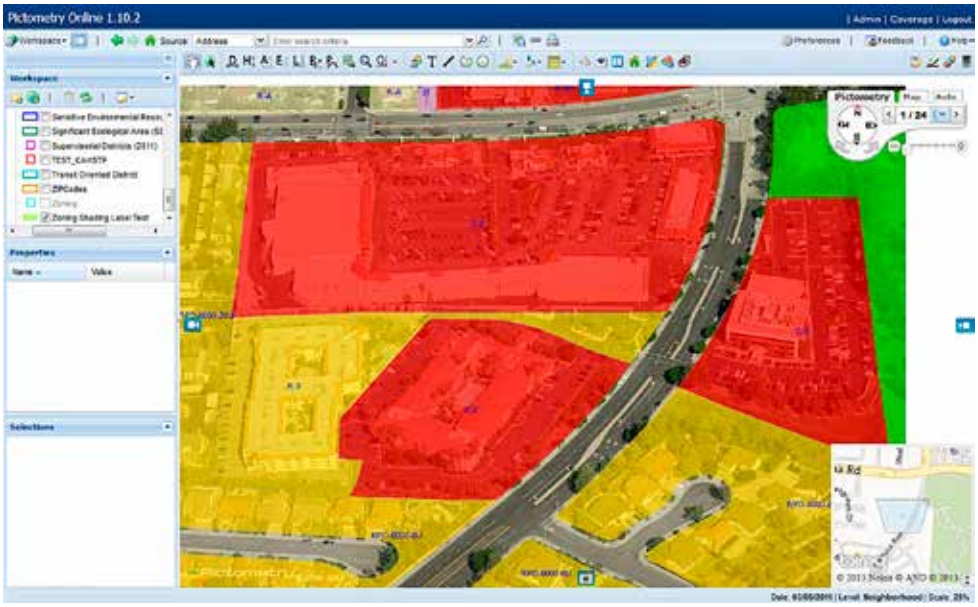
The Next Technology Push: Mobility and Data as a Service

The next big technology push is mobility and data as a service (DaaS). GIS is an important tool for assessors, and the need to have immediate access through mobile devices is growing, including the need to provide accurate geographically driven data. The ability to have information that is constantly updated by several departments because they can upload corrections and/or new data is priceless. Everyone shares in the benefit of finding trends and maintaining overall accuracy of data for public safety, land use planning, and more.

Part of the DaaS goal is to extend the GIS services beyond imagery by adding other critical GIS data sets, such as infrastructure, roads, and address information, to the services provided as part of the consortium. The long-term goal is to make GIS more accessible and usable for everyone in Los Angeles County by extending the GIS platform for LARIAC to include imagery. With GIS solutions and software, cities and agencies can focus on building applications that fit their needs rather than importing data and installing software. Additional data that LARIAC could provide to its members include street view imagery, change analysis, and planimetrics.

With the immense opportunity to develop solutions with the LARIAC program, all parties are committed to helping extract critical data from the imagery—ortho, oblique, LiDAR, or street view. With three million structures requiring sketches and change analysis, it is an ongoing process to keep

Figure 5. Shading layers over POL imagery support planning and addressing of parcels



the data updated and provide solutions for several different workflows. By having the base imagery and GIS solutions already in the central location as part of the DaaS, cities and departments can focus on key updates for their residents, including zoning, permits, and address accuracy.

As with every enterprise software system, security and redundancy are critical. The LARIAC program, with its focus on DaaS, has brought that to the assessor's office. Solano's team was especially happy with the data storage and redundancy provided from the enterprise infrastructure and cloud-based access. DaaS is providing the platform not only to build applications but also to store all data safely utilizing the strong security and redundancy of enterprise systems.

DaaS is the key to future success and continued growth. Providing the additional forms of imagery, including street-level and three dimensions, while continually striving for higher resolution oblique, ortho, and LiDAR imagery is the consortium's number one goal. And, as noted earlier, the intent of LARIAC is to make this an enterprise solution with access for everyone. Everything lives on a map. When a map can be overlaid with visual intelligence and made available to the masses, it is a win-win at an enterprise level.

Many cities have recognized the strength of collaboration and shared data and are working with the Los Angeles County Office of the Assessor, utilizing the imagery and then adding planimetrics including building outlines and object identification. One city is locating and identifying billboards using third-party services. Planimetrics will be a major consumer of the data and analytics. Local governments have identified location services—attributing data to the object or location and then delivering dimensions and measurements—as an essential component of their operations. LiDAR is also important for water control, vegetation growth, and elevations.

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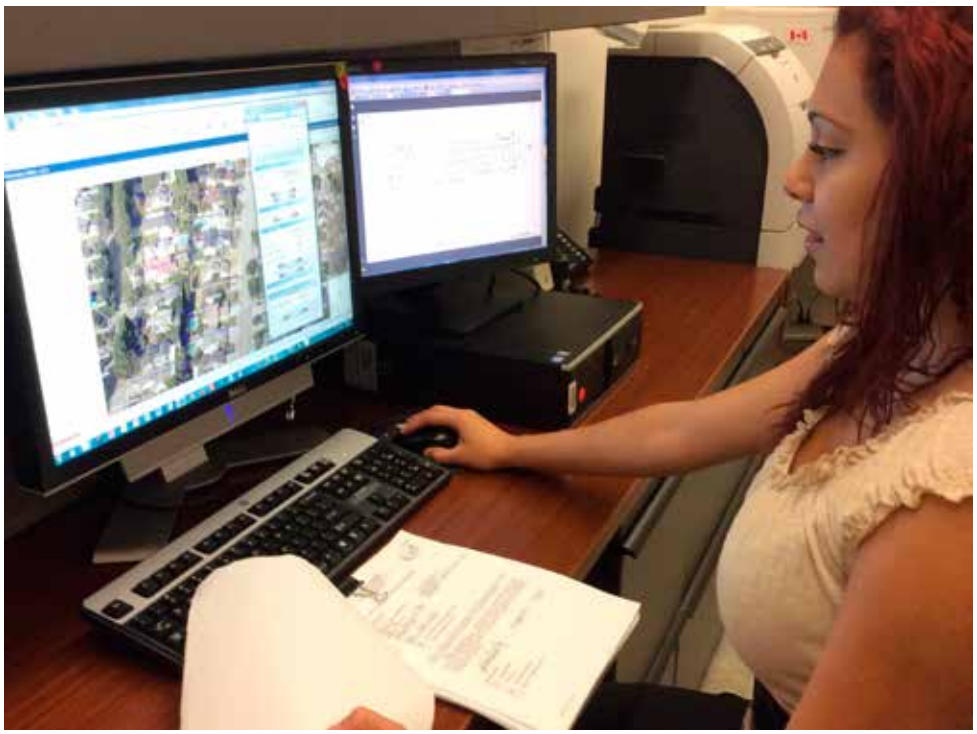
LARIAC as a Key to Collaboration and Cost Savings

A major accomplishment of LARIAC has been the breakdown of silos. It has saved its participants more than $15 million during the life of the project. LARIAC has also been the key to growing partnerships between the cities and the county based upon the shared effort to make the project successful. Data accuracy, quality, and consistency of imagery combine to improve public information and education. The assessor's office is committed to LARIAC and the continual improvement in services through the enterprise GIS solutions being developed. The office has been able to focus on what is important to property owners. Improved public communications, fair and equitable valuations, and overall cost savings make a difference that everyone notices (see figure 6).

For the assessor, the timing and goals of the consortium worked. By investing in the right technology, the right companies, and the right IT and GIS personnel, the assessor and LARIAC made major enhancements to the way the county does business. Focusing on sharing data and imagery at a technical level made sense and made a difference.

Now more than 40 cities and multiple departments and organizations share the same data and aerial imagery. Where it is easy to traditionally get caught up in politics and silos, this group of technical GIS and mapping professionals has provided the platform that creates true collaboration.

Figure 6. Multiple departments and cities in Los Angeles County access POL to view imagery and data



Conclusion

LARIAC is an internationally recognized model of regional cooperation, garnering attention by enabling participating governments to efficiently and cost-effectively acquire and provide high-quality imagery-based services. The county has established a reputation as a visionary leader in the open and collaborative development and use of geographic information.

Through program meetings, workshops, and user groups, LARIAC has supported knowledge transfer and alignment of effort among cities, and this has led to the improved use of aerial imagery and other geographic data products. The ultimate beneficiaries of LARIAC are the public, who benefit from lower total cost of government, better application of resources, and more efficient government operations.

Mark Greninger is Geographic Information Officer for the Los Angeles County Office of the Assessor. A graduate of Stanford University with a degree in environmental geology, Mark quickly became passionate about GIS and has been in the field ever since. He began his work at the Environmental Protection Agency in San Francisco, where he built his first GIS platform. He then moved to Los Angeles County, where he now oversees the deployment and effective use of GIS technology for the county's 100,000 employees and 10 million residents.