GIS Best Practices

Public Works, Vol. 2

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ESRI

Table of Contents

What Is GIS?

Making decisions based on geography is basic to human thinking. Where shall we go, what will it be like, and what shall we do when we get there are applied to the simple event of going to the store or to the major event of launching a bathysphere into the ocean's depths. By understanding geography and people's relationship to location, we can make informed decisions about the way we live on our planet. A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions.

GIS organizes geographic data so that a person reading a map can select data necessary for a specific project or task. A thematic map has a table of contents that allows the reader to add layers of information to a basemap of real-world locations. For example, a social analyst might use the basemap of Eugene, Oregon, and select datasets from the U.S. Census Bureau to add data layers to a map that shows residents' education levels, ages, and employment status. With an ability to combine a variety of datasets in an infinite number of ways, GIS is a useful tool for nearly every field of knowledge from archaeology to zoology.

A good GIS program is able to process geographic data from a variety of sources and integrate it into a map project. Many countries have an abundance of geographic data for analysis, and governments often make GIS datasets publicly available. Map file databases often come included with GIS packages; others can be obtained from both commercial vendors and government agencies. Some data is gathered in the field by global positioning units that attach a location coordinate (latitude and longitude) to a feature such as a pump station.

GIS maps are interactive. On the computer screen, map users can scan a GIS map in any direction, zoom in or out, and change the nature of the information contained in the map. They can choose whether to see the roads, how many roads to see, and how roads should be depicted. Then they can select what other items they wish to view alongside these roads such as storm drains, gas lines, rare plants, or hospitals. Some GIS programs are designed to perform sophisticated calculations for tracking storms or predicting erosion patterns. GIS applications can be embedded into common activities such as verifying an address.

From routinely performing work-related tasks to scientifically exploring the complexities of our world, GIS gives people the geographic advantage to become more productive, more aware, and more responsive citizens of planet Earth.

GIS for Public Works

Public works professionals are responsible for numerous assets such as transportation and water infrastructure, vehicle fleets, public signage, and many other civic features and facilities. GIS equips public works departments with the data management and mapping capabilities needed for better asset and work order management, planning, and prioritization.

Developing a public works information system based on GIS software will facilitate the management of a department's infrastructure projects and improve its efficiency and productivity by streamlining workflows, asset management, and operations.

This server-based GIS can house many applications such as asset, pavement, and work order management; routing; traffic analysis; and accounting. Sharing data throughout the various departments of an organization saves time and money while increasing efficiency and productivity.

ESRI's ArcGIS software allows a public works department to

- Holistically monitor asset maintenance and project management to ensure project coordination.

- Prioritize projects to deliver the greatest benefits.

- Inform the public of project status with GIS-based Web mapping applications.

- Share data with other departments to eliminate data collection and storage redundancies and cost.

- Route crews more efficiently to reduce fuel consumption, maximize staff and equipment resources, and increase productivity.

Singapore Manages Urban Forests Using GIS

Garden City-State Maintains 1.3 Million Trees

Highlights

■ National Parks Board catalogs 1.3 million trees and shrubs with server GIS.

■ Multiple government agencies share geospatial data through a custom GIS application.

■ A mobile GIS data collection process saves time and streamlines the tree cataloging process.

Envision a 263-square-mile island city-state that is one of the world's busiest seaports, a major oil refining and distribution center, a leader in shipbuilding and repair, an aggressive supplier of electronic components, and home to more than four million residents. It sounds hectic, but it's more relaxing when you imagine that the same island has more than 36 square miles of parks, open spaces, nature reserves, roadside greenery, and vacant lands and 16 additional square miles reserved for parkland when the population reaches 5.5 million. You are imagining the island country of Singapore, known to many as the Garden City.
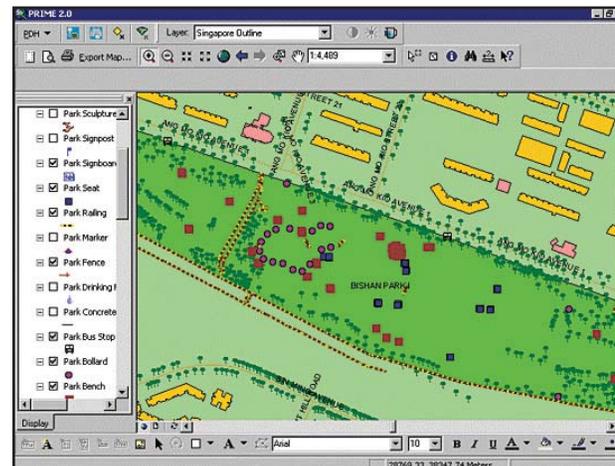
For each tree pictured on the PRIME interface, NParks stores additional information about its size, species, health, and trimming history.

Singapore has not always been known as the Garden City. In 1963, Prime Minister Lee Kuan Yew recognized the importance of greenery as a factor in attracting foreign investors, so he launched a tree-planting campaign. However, the investors came faster than the trees, resulting in a modern landscape that was heavy on development and light on vegetation, until 1976 when the Parks and Recreation Department was formed and tasked with aggressively planting trees and shrubs around the island. Simultaneously, the Ministry of National Development initiated road codes, which mandated that adequate planting areas be provided along new roads. An islandwide parks program led to the improvement and creation of national parks, and developers of residential areas were required to plant roadside trees and set aside land for open space. By the mid-eighties, Angsana, rain tree, yellow flame, and mahogany trees and vines—such as bougainvilleas and Ficus pumila—provided visual relief from expanding structural development, turning Singapore into the Garden City that Prime Minister Yew envisioned.

In the 21st century, Singapore has continued its aggressive planting practices, and just as its electronics industry has flourished with new technology, so have its methods for identifying, cataloging, and inspecting trees. The Singapore National Parks Board (NParks) supervises 1.3 million trees located in 300 parks and on more than 2,400 hectares of Garden City roadsides using GIS. NPark's GIS, known as the Park Integrated Management System (PRIME), is a custom software application built and hosted on an ArcGIS Server platform. ArcGIS Server was chosen because, for more than a decade, NParks and other government agencies in Singapore have shared information through a common GIS called the Land Information Network (LandNet), also supported by ArcGIS.

LandNet hosts an island basemap containing layers such as roads; buildings; waterlines; parks; and, of course, trees. Updates in the tree layer of PRIME go directly to LandNet; thus, any tree data imported into PRIME becomes visible in the LandNet environment. Through LandNet, the Land Authority, Singapore's Land Transport Authority, and Urban Redevelopment Authority access NPark's tree data regularly. For safety reasons and as reference to help preserve trees in the construction of new roads, as well as in the widening of existing roads, it is crucial that the Land Transport Authority knows where each tree is located along Singapore's roads and railway infrastructure. It is also useful for the Urban Redevelopment Authority to know where trees are located when planning new housing or business developments. This information can be accessed and viewed from desktop computers, or it can be used to produce paper maps.

ArcGIS Server technology also supports mobile computers, which NParks uses in the field to record its tree data. NParks' field crews use handheld computers equipped with ArcPad to log data related to the position, size, health, and species of each tree. Once data is entered, the GIS integrates with the database to generate and assign a unique ID to each tree and stores it in the PRIME geodatabase. NParks began using GIS to capture tree locations in early 2000, and currently, most of the roadway trees and trees in the abutting open spaces have been recorded. A smaller percentage of national parks trees have been cataloged in the PRIME geodatabase due to other constraints.

"The previous method for cataloging trees was a very manual process," says Tee Swee Ping, NPark's assistant director of Streetscape. "It involved a tedious manual ID system and a lot of paperwork. GIS is much faster and more efficient and provides better documentation. It is very neat, clean, streamlined, and standardized."
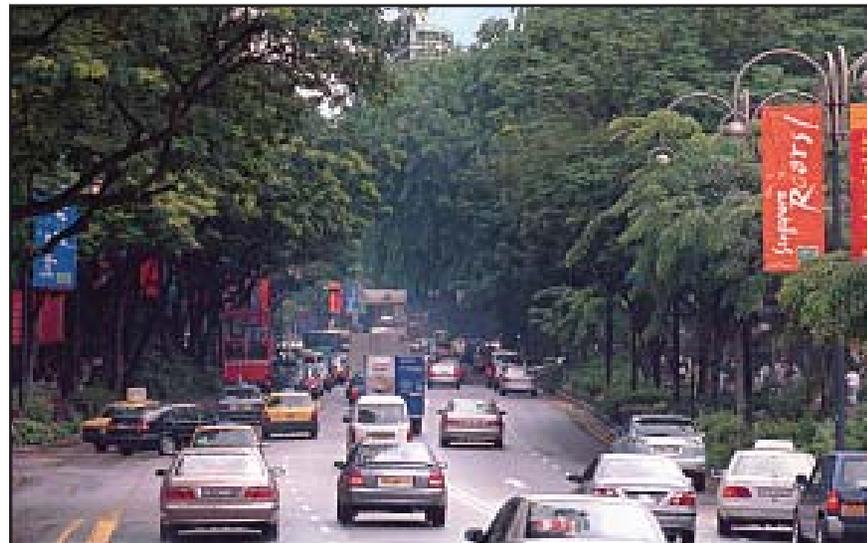
Singapore's busy Orchard Road is well known for its traffic, shopping, and trees.

In addition to importing data on location, size, and species, for legal purposes, a health inspection is conducted regularly and recorded each time a tree is trimmed. Tee says that having information about the inspection and pruning history of a tree is documented proof that NParks is giving due care to its trees. Between NParks' employees who prune trees on the

roadway and in the parks, the employees who develop new parks, and those who concentrate on how the development of land will impact existing trees, there are more than 150 workers dedicated to caring for NParks' trees.

As urbanization has continued to spread throughout Singapore, so have efforts to keep the island rich in vegetation. Developers are required to replace or replant for every tree uprooted during construction, and the road codes for planting along new roadsides are still enforced. New parks continue to be developed and populated with tree shade, and government and public programs—such as Heritage Tree Scheme, Heritage Roads, Community in Bloom, and Plant-A-Tree—promote a good balance of industry and nature. Recording Singapore's trees in a GIS helps NParks and other government agencies assure that these policies, guidelines, programs, and stipulations are followed.

"Quite a number of people have suggested that we implant a chip in every tree that could be read by GPS," says Tee. "What is the added advantage of that? I already have my GIS with different views and layers inside. Our goal is to get a physical description and the position of each tree in relation to other objects, and our GIS does that. We have our roadway layer in our GIS. We have our lamppost layer in our GIS. We have our tree layer in our GIS. We have good GIS basemaps, and when you add all those layers, you can visualize everything in perspective and accurately."

(Reprinted from the Spring 2009 issue of *ArcNews* magazine)

Managing Street Sign Assets

An Enterprise Geospatial Business Systems Integration Solution

By Nathan Jennings, City of Sacramento, California

Summary
The City of Sacramento's integration of an enterprise asset management system with GIS for street sign assets led to greater efficiency with little customization.

Integration of GIS with the street sign asset inventory and an existing work order management system is the most recent in the continually growing list of successful GIS integration projects developed for the City of Sacramento, California.

The Department of Transportation (DOT) uses the Infor EAM (Enterprise Asset Management) system to manage work orders for all street, sign, and other right-of-way (ROW) assets such as street trees. In partnership with the Department of General Services and the Information Technology Department Central GIS team, DOT has implemented the GIS module of Infor EAM to more effectively manage street sign assets in the city. The EAM DOT implementation is the first in the department to fully implement a solution that collects and manages assets using Infor EAM integration tools to synchronize GIS data with the Infor EAM work order management system.

Meeting a Business Need

The city wants to reduce the number of redundant enterprise information systems that collect and manage information. Efficient information collection, management, and integration with business systems—with as little customization as possible—is a high priority. The Department of Transportation has been using the Infor EAM system to manage work orders against assets for several years. However, efficiently scheduling and dispatching work is difficult to manage without having the spatial location information associated with assets. The Traffic Signs and Markings Division approached the Central GIS Unit to design and implement a GIS solution to collect street sign assets, manage spatial and attribute changes to existing assets, and integrate GIS information into the Infor EAM work order management system.

The Central GIS Unit devised a business workflow that allowed the Traffic Signs and Marking Division to create new traffic sign assets while updating existing sign asset locations, attributes, and work orders. Figure 1 provides an overview of this process.
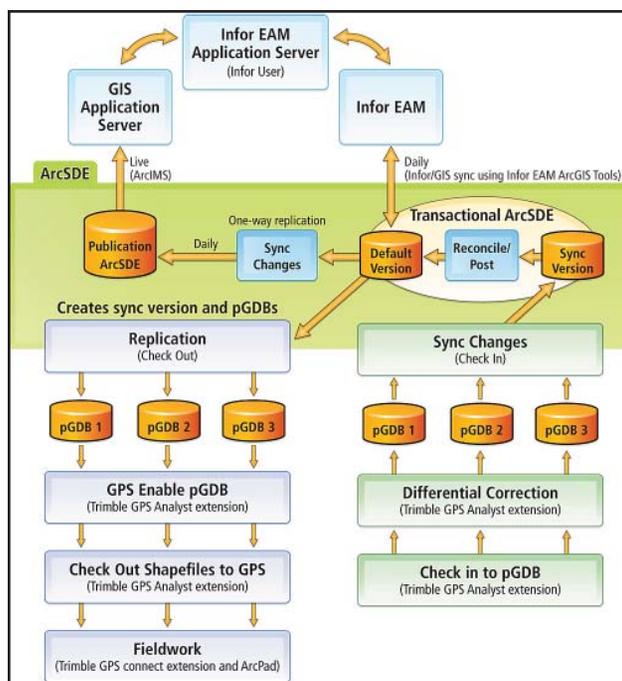
Figure 1: Traffic sign inventory GIS workflow.

Business Workflow Development

The Central GIS Unit met with the Traffic Signs and Markings Division and Infor to map out the business workflow that would inventory and maintain the traffic sign database that manages spatial edits using ArcSDE technology* and work order management in Infor EAM. During the business workflow development phase, it was determined that a field data collection component was needed.

The Central GIS Unit recommended the division use the Trimble GPS (GeoXT) unit that the division had already purchased. The business development team identified the specific spatial features and attributes that needed to be collected in the field. In addition, traffic sign supervisors were identified as the staff members who would use the GPS unit for creating the new assets when notification to Underground Service Alert (USA) teams was required.

*ArcSDE technology is built into ArcGIS Desktop and ArcGIS Server. It is no longer a stand-alone procedure

The need for a GIS data manager role was also identified. The GIS data manager would update and maintain existing sign assets, coordinate the field data collection activities of the supervisors, and postprocess and integrate field data into the ArcSDE transaction and the Infor EAM databases.

Data Collection, ArcSDE Synchronization, and Work Order Management Systems Integration

The Central GIS Unit started testing field data collection procedures and ArcSDE update and synchronization procedures once the business development phase was completed. The Traffic Signs and Markings Division had already decided to use Trimble GPS units because this group already used the unit for other basic field data collection tasks.

The Central GIS Unit recommended using a noncustomized ArcPad application, Trimble GPScorrect extension for ESRI's ArcPad, and the Trimble GPS Analyst extension for ArcGIS Desktop for collecting, correcting, and processing field data using GPS. Standardized attribute domains were developed and incorporated in pick lists in the ArcPad application running on the GeoXT units. Because these products function seamlessly with ArcSDE and personal geodatabases and require no customization, the division was able to keep down the cost of hardware and software and alleviate the need for creating and maintaining a custom ArcPad application. This helped streamline data integration to/from the ArcSDE transactional database.

Efficiently scheduling and dispatching work on street sign assets was difficult without the spatial location information associated with assets. The integration of GIS with the asset management system greatly improved this system.

During the business workflow phase, the Traffic Signs and Markings Division decided three or four field people would be needed to collect and update the sign inventory. ArcSDE checkout replicas were developed to generate individual personal geodatabases for each GPS unit so sign data could be checked out to each field-worker. This would take advantage of the GPS Analyst extension's ability to check data out as

shapefiles for update in the field, then check new and updated features and GPS positions back into the geodatabase as well as perform postprocessing differential correction on the field data while in ArcGIS.

An ArcSDE one-way replication process was developed to create the communication link between the transaction and publication ArcSDE databases. A simple Python script was created that uses a Windows scheduled batch process to perform the data transfer between the transaction and publication environments on a nightly basis, during off-hours. The Central GIS Unit also developed back-end processes to use the Infor EAM ArcGIS toolbar to synchronize the transaction ArcSDE with the Infor EAM database. This synchronization occurs prior to the nightly automated synchronization.

Business Systems Integration Testing

Once the field data collection, ArcSDE, and Infor EAM integration processes were developed, the full sign inventory workflow needed to be tested before implementing the GIS and work order management integration processes in a production system. The Central GIS Unit maintains both a development and production set of ArcSDE servers and software. The Central GIS Unit and Infor EAM business teams follow standard information technology testing and implementation practices that involve coordination with other information technology staff, database administrators, and other GIS analysts and their respective projects.
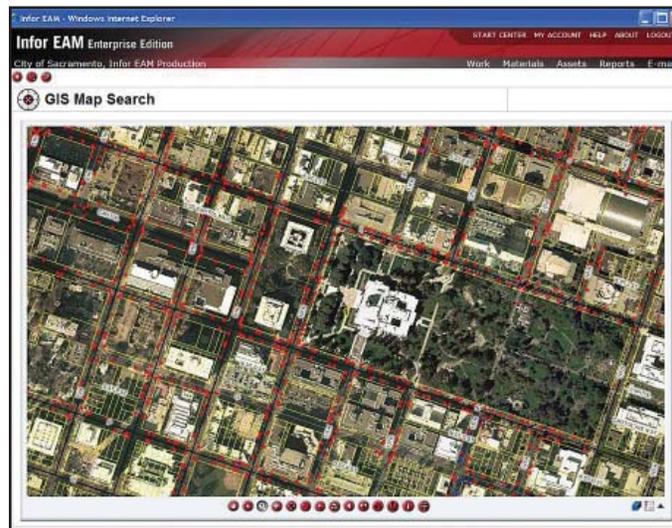
Mapping street sign assets in ArcMap.

The workflow described above was fully tested in the city's development ArcSDE and Infor EAM environment to ensure that field data collection processes, data check-in/checkout procedures, and ArcSDE and Infor EAM synchronizations were functioning properly. Once the integration team members were satisfied with the workflow and performance functions, the sign inventory workflow was transferred to production ArcSDE and Infor EAM systems.

Production Implementation

After all of the GIS and work order management systems were thoroughly tested for managing and updating data, the traffic sign inventory was put into production. In this phase, the production transactional and publication ArcSDE, GIS application, and Infor EAM work order management environments were used. Replication, synchronization, and back-end scripting processes were modified to point to production data. In the first nine months of the sign inventory, the Traffic Signs and Markings Division staff of four field-workers collected nearly 10,000 street sign assets (e.g., signs, crash attenuators, parking meters, barricades, and guardrails).

Post Implementation Discoveries

Actual field data collection began in November 2007. The initial sign inventory was conducted in downtown Sacramento, an area with many tall buildings and large trees that delay the acquisition of a quality GPS signal when locating an asset. After a short time, the primary GIS data manager decoded that inventorying existing signs was more efficiently accomplished using Panasonic Toughbook Tablet PC loaded with ArcPad and the city's high-resolution (6-inch) digital orthophotography, street centerlines, parcels, and Master Address Database rather than GPS units with ArcPad. Based on visual information and infrastructure data layers, field-workers could quickly and accurately locate the sign assets without using GPS. The data manager continued dispatching workers with Trimble GPS, ArcPad, high-resolution imagery, and infrastructure GIS files to parts of the city that did not have tall buildings or large trees. The combination of data collection methods has proved beneficial.

Future Integration Projects

With the success of GIS asset collection, the Traffic Signs and Markings Division is investigating the possibility of integrating digital photos of signs with sign location information. Although digital image collection was originally proposed as part of the data collection process, it was postponed to a future phase of the sign inventory.

In addition, the city is applying the knowledge and skills gained from the street sign inventory to other citywide asset management projects. The city will be developing an inventory for all city-owned trees that will be managed by city staff using the methods developed for signs. The city is also working with the Parking Division to inventory parking meters using geocoding processes for the initial placement of parking meters and field data collection methods for ongoing data maintenance.

Traffic Signs and Markings, Urban Forest Services, and the Parking Division—all part of the Department of Transportation—use the Infor EAM work order management system. The asset inventory methods and protocols developed for street signs are helping build efficiencies and streamline asset data collection, management, data update, and field crew dispatch and more effectively perform labor and expense tracking. This was accomplished without custom field data collection methods or software. The current ArcSDE implementation is running on Oracle, the standard configuration for the Infor EAM work order management software; uses ArcGIS toolset; and regularly manages GIS base data (e.g., streets, parcels, addresses, and orthophotography).

(Reprinted from the Winter 2009 issue of *ArcUser* magazine)

Meeting New Street Sign Reflectivity Requirements

City of Fontana, California, Uses GIS-Enabled Asset Management System

Highlights

■ Street sign location and reflectivity data is catalogued with a GIS-enabled asset management system.

■ An ArcIMS software-powered site lets field crews access the system from mobile computers in real time.

■ ArcGIS Desktop is used to visualize and analyze the collected sign data and generate reports.

In response to a new requirement on minimum standards for sign reflectivity that the Federal Highway Administration (FHWA) established in December 2007, the City of Fontana, California—appropriately named the "City of Action"—has a plan well under way to meet compliance deadlines that are still years away.

Starting with stop signs in late 2007, the city has been gathering data on the reflectivity of regulatory signs and manages that data with a GIS-enabled asset management system.

By January 2012, government agencies must establish and implement a sign assessment or management method to maintain the minimum sign retroreflectivity levels. January 2015 is the compliance date for regulatory, warning, and ground-mounted guide signs.

The new sign reflectivity requirement is meant to make roads safer and reduce roadway fatalities. Though only about one-quarter of travel occurs at night, approximately one-half of traffic fatalities occur during nighttime travel.

To measure reflectivity, agencies can use either of two assessment methods: visual assessment or a portable retroreflectometer. The City of Fontana had previously monitored the reflectivity of signs visually with headlights or flashlights but wanted to adopt a more scientific approach.

Since late 2007, the city has been gathering data on the reflectivity of regulatory signs with a RetroSign retroreflectometer gun enabled with GPS. Starting with stop signs, field crew members are measuring the locations and reflectivity of assets with one click of the gun and managing that data with a GIS-enabled asset management system from GBA Master Series Inc., an Overland Park, Kansas, ESRI Business Partner.

"This was an ideal time to begin working with the retroreflectometry device, well in advance of the compliance deadline," notes Joseph Field, GIS administrator for the City of Fontana.

Efficiency in the Field   Using a GPS-enabled retroreflectometer gun allows city field staff, with one click of the trigger, to collect two types of data at once. The gun contains a record for a sign's reflectivity reading and coordinates, and that record number corresponds to the same record number in the asset management database.

City of Fontana crew at work.

"We thought this would be the easiest way to bring our inventory into compliance," says Rogelio Matta, senior administrative analyst of the public works department. "We're also incorporating this into our workflow to improve our inventory management. Our crew is out there measuring reflectivity but also collecting data, such as orientation, material type, and condition of the signs, and replacing signs on the spot when necessary. All of that data is quickly uploaded to our GIS-enabled asset management system."

An ArcIMS* software-based site named GIS Browser is used throughout the city, including in the field for this initiative. Public works crew members access the asset management system application in real time on a Panasonic notebook computer.

Via the ArcIMS application and the GBA Master Series asset management system, crew members can remotely reference data related to existing signs, such as a sign's record number and its location and orientation, as well as create a record for a new sign.

This method for data collection has the added benefit of allowing the city to retain institutional knowledge, the information that staff members know but which had not traditionally been documented.

In the field, public works crew members can access the city's GIS browser via a Web site powered by ArcIMS. In this browser, they can view and input data, such as sign orientation and condition.

*ESRI's development of ArcIMS is now limited. Server GIS development efforts are devoted primarily to ArcGIS Server.

"Institutional knowledge is one of the big things for us, and how we convey that institutional knowledge is through these databases," says Matta. "We don't want to just know that there is a stop sign there; we want to know what the field crew who is working with it knows about it. GIS allows all of us to see the data. Being able to see, for example, where all of the stop signs are located in the city and their conditions is powerful. It helps us quickly make decisions about asset management and relate information to field crews about the work they need to do."

Back in the office, ArcGIS Desktop is used to visualize and analyze the collected data and generate reports. ArcSDE technology manages the geodatabase. Reports can be accessed via the ArcGIS Desktop application interface or via the asset management system application.

"I encourage other governments to utilize GIS and GPS to capture and maintain data whenever possible, because it cuts down on confusion and also makes for a more efficient operation," Field notes.

(Reprinted from the Summer 2008 issue of *ArcNews* magazine)

What's New in Town?

ArcGIS Server Application Keeps Public Informed of City Projects

By Ramona Navarrete, City of Folsom, and Mark Perry, GeoPrise

Summary   *A fast growing California city has developed an ArcGIS-based application that supplies current and easily accessed information on planned and ongoing projects in the city. Data can be easily updated by city staff.*

The city of Folsom, California, has experienced rapid growth. Its population has increased by more than 60 percent in the past decade. This growth has created a wide range of new development projects including subdivisions, malls, parks, trails, and infrastructure upgrades that have often led to traffic congestion, planning coordination issues, and the subsequent need for better dissemination of public information about these projects.
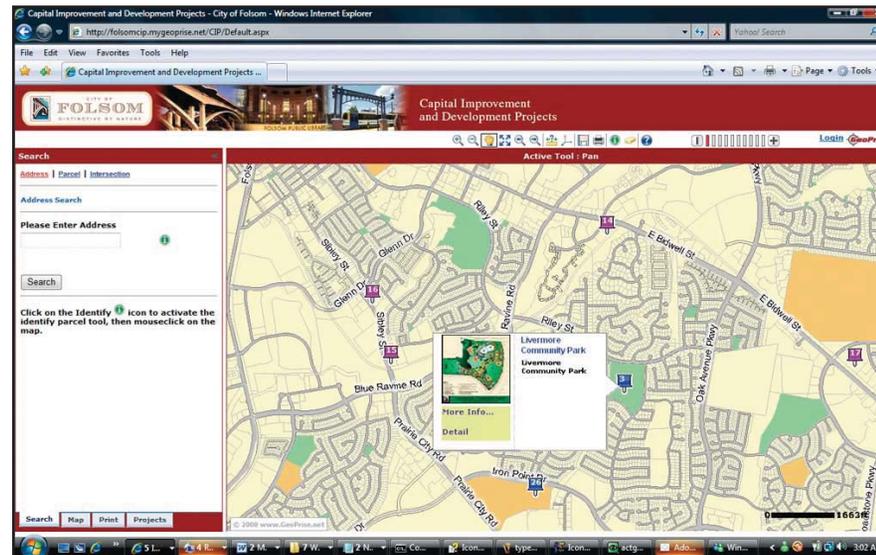
All the controls required to browse the site and retrieve development project data are available on the opening page of the application. Checkboxes allow users to quickly filter by department or project type. Persistent tab sets ensure quick access to project filters, PDF printing templates, overview, and search tools.

To inform the public of new services, warn citizens of possible project commuting impacts, and reduce staff time handling public inquiries, the city launched its first map-based Web site in November 2007. The site allows the public to quickly and easily view information about the city's capital improvement projects (CIP) and development projects. The ArcGIS Server-based solution, developed by ESRI business partner GeoPrise, has helped the city enhance the quality of life by keeping citizens better informed while decreasing the amount of time city staff spend responding to public inquiries and ensuring they stay better focused performing essential daily services.

Effectively and simply communicating project information was the most important design consideration for the project. Web site specifications required an application that was simple and intuitive to use and included common Web mapping features and tools. The application should also be visually attractive and integrate the color scheme and graphics used by the city's existing Web site. An additional goal was the creation of a simple interface that would allow individual department users to load and update project information in a secure environment. With limited programming staff and a tight deployment schedule, the city also sought a commercial off-the-shelf (COTS) solution that could be configured to meet the project's goals and eliminate a lengthy internal development cycle.

The solution is based on ArcGIS Server and leverages its Service Oriented Architecture (SOA) and .NET Web Application Developer Framework (ADF). The result is an extensible and flexible technology. The application user interface, developed with Microsoft .NET 2.0 and AJAX, is easy for the public to use and city staff to manage and customize.

Intuitive mouse-over controls instantly display project development information in compact summary format. Additional mouse-over controls display project details, and embedded document retrieval functionality can display extensive information as pop-up PDF or multipage TIFF documents. Administrative wizards generate graphics and matching color schemes, creating a user interface that matches the city's existing Web site.

The toolset is simple to use. The controls required to browse the site and retrieve development project data are available on the opening page. Checkboxes in the AJAX application panels allow users to quickly filter by department or project type. The always available tab sets ensure quick access to project filters, PDF printing templates, overview, and search tools.

The Capitol Improvement and Development Projects Viewer project was completed in less than 90 days and was implemented in less than 30 days. The city worked with the consultants to create the map service, develop attributes supporting the search functions, compile the required development project data, and select appropriate color schemes and supporting header graphics. Previously, members of the public had to visit city hall to pick up hard-copy documents or search multiple department Web pages to find documents that described the schedule, funding, and updated status or furnished photos and diagrams of capital improvement and development projects.

Users were trained to use the Web-based project administration deployment tools so that each department could post its own project data. The GIS department helped users refine the images used in the thumbnail project images, develop appropriate project details, and create supporting project description documents in an automated fashion. Information on new projects is entered using administrative logins right from the application interface.

Once logged in, administrative users can edit existing projects by hovering over the project SmartPoint. A standard pop-up panel is displayed with additional links for editing project details and removing old projects. To enter a new project, the user zooms to the project map location, right-clicks on the map, and selects Add SmartPoint from the context menu.

The Add SmartPoint panel allows administrative users to select a department and category, name the new project, and enter a brief project description and a detailed description. Two browse options allow administrative users to select and upload a thumbnail project image and a detailed project PDF document that are saved to the server. Immediately the project is posted and available to end users.

Administrative users logged on to the system can edit existing projects by hovering over the project SmartPoint and invoking the pop-up panel. Users enter a new project by right-clicking on the project location and selecting Add SmartPoint from the context menu.

The CIP and Development Project Viewer application has successfully met the original project goals. It has also helped coordinate data updates internally. The GIS Department, which is responsible for coordinating address assignment with the county, monitors this site to learn about new and upcoming projects. Future coordination with the Community Development Department will involve formalizing the posting of multipage plan documents to make available new parcels and address assignments so that GIS can more quickly update the city GIS basemap layers. This integration of data maintenance associated with project developments has been an unexpected but well-received and eagerly pursued benefit to city staff.

(Reprinted from the Spring 2008 issue of *ArcUser* magazine)

Mobile GIS Improves Code Enforcement Services in McAllen, Texas

By Brian Wienke, Product Manager, Accela, Inc.

Code enforcement is critical to a city. Monitoring violations of municipal codes and land use requirements helps maintain a safe and desirable environment. Faced with a growing workload and reduced revenues in 2006, the code enforcement department in the City of McAllen, Texas, began looking for ways to increase its efficiency and productivity. The solution was mobile GIS.

Prior to the implementation of its mobile GIS, the city relied on a paper-based process that required code enforcement officers to spend valuable time in the office checking several different Web sites to gather accurate owner, parcel, and address information prior to actually going out in the field to perform their inspections.

To correct the inefficiencies of its antiquated paper-based system, the city conducted a workflow analysis that led to the development of an automated system for tracking code enforcement cases.

Based on this success, the city decided to automate the entire process and selected a Web-based solution that included Accela Automation from Accela, Inc. This local government software suite automates a number of daily tasks including workflow management, activity tracking, and report generation.

To extend the functionality of Accela Automation across the enterprise and out into the field, McAllen also implemented Accela Wireless, which is built with ESRI's ArcGIS Mobile fully embedded within it. With this fully integrated, enterprise-wide solution, the city began to realize significant improvements in its code enforcement services.
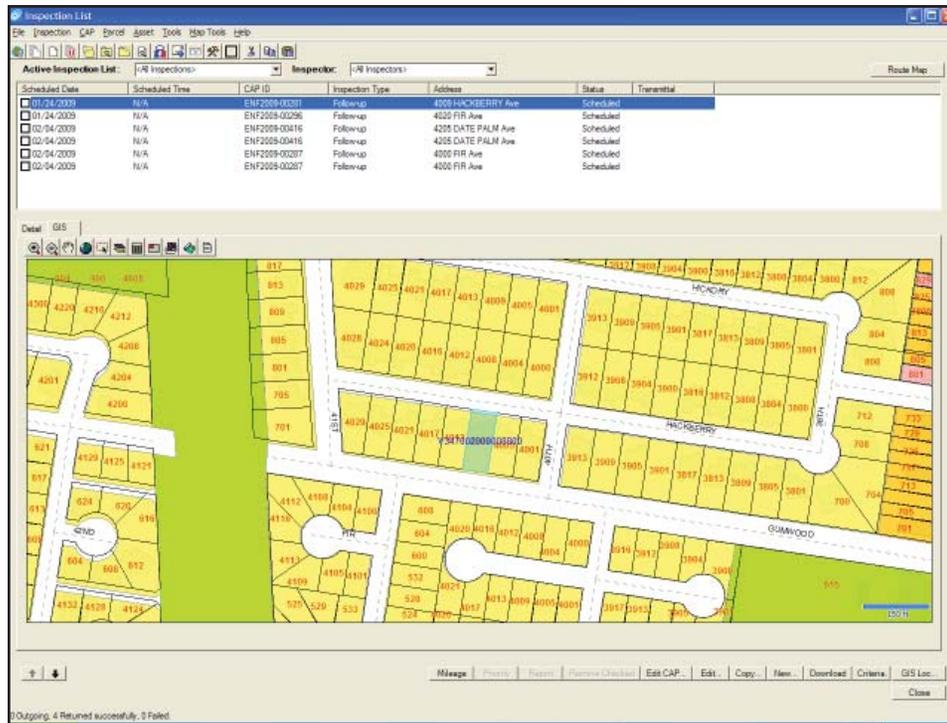
*Using the embedded map, inspectors can quickly locate their inspections, as well as
select parcels on the map and create new inspections or cases from the field.*

The mobile GIS enables workers to display, inspect, capture, and update geographic
information from the field. Collected data includes address, owner, and parcel information;
zoning classifications; and physical locations within city limits. Field officers can also file code
enforcement cases to speed up data delivery and the system allows one officer to easily follow
up on the status of an inspection or Notice of Violation performed by another officer.

McAllen's mobile GIS solution enables code enforcement officers to utilize fully functional maps
and perform updates in real time, which streamlines their administrative processes and enables
faster customer response times.

"Now the code enforcement process is more accurate and efficient because everything is
available in one solution rather than having to go to different sources for the data," says Jose
J. Peña, McAllen project manager. "Our officers have also gained experience with navigating

the city's GIS Web site, which they had previously only used occasionally. The new mobile implementation not only met, but exceeded all of our expectations."

Among the benefits the city has realized are improved response times, an increase in cases handled, and greater staff efficiencies.
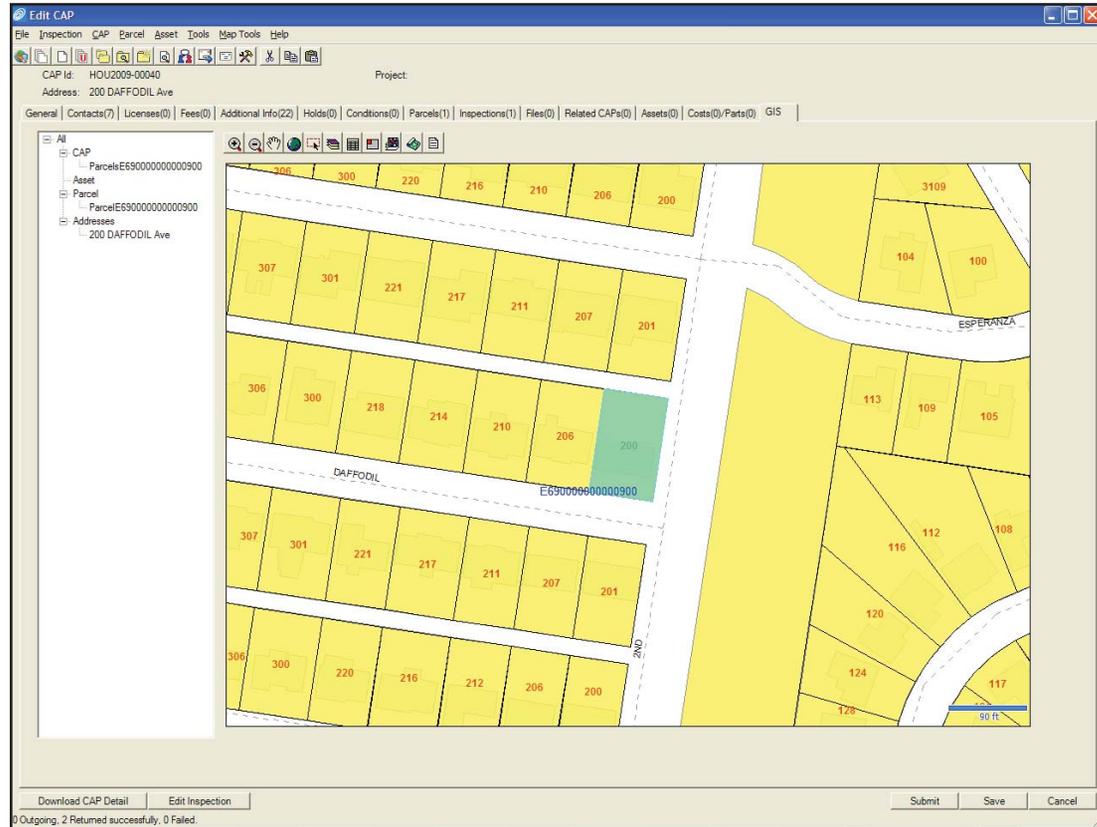
The inspectors use the embedded GIS maps and data to obtain additional information such as address and parcel relationships, and other attributes, while performing their inspection tasks.

"We processed about 5,000 code enforcement cases in 2007 and about 9,000 cases in 2008 after implementing the new system," says Peña. "We wouldn't be able to keep up without the ArcGIS Mobile capability in the mobile solution. Case completion is much faster and makes our officers more efficient, accurate, and accountable for the cases we are working on."

Recently, McAllen's building inspectors have also started to use the mobile GIS solution. They find it extremely beneficial to see inspection locations on a map rather than using an address and directions to find a site. Other mapping applications are on the horizon for the city's planning and development departments.

"The mobile GIS solution is practical, useful, and has a direct impact on the quality of service we can provide to the community," concludes Peña. "We are able to visually examine the spatial distribution of cases throughout the city, giving us a new perspective on the work being done by our code enforcement officers. In addition, it helps us better determine if each section of our city is being properly served."

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