

# Managing Street Sign Assets

An enterprise geospatial business systems integration solution



By Nathan Jennings, City of Sacramento, California

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.

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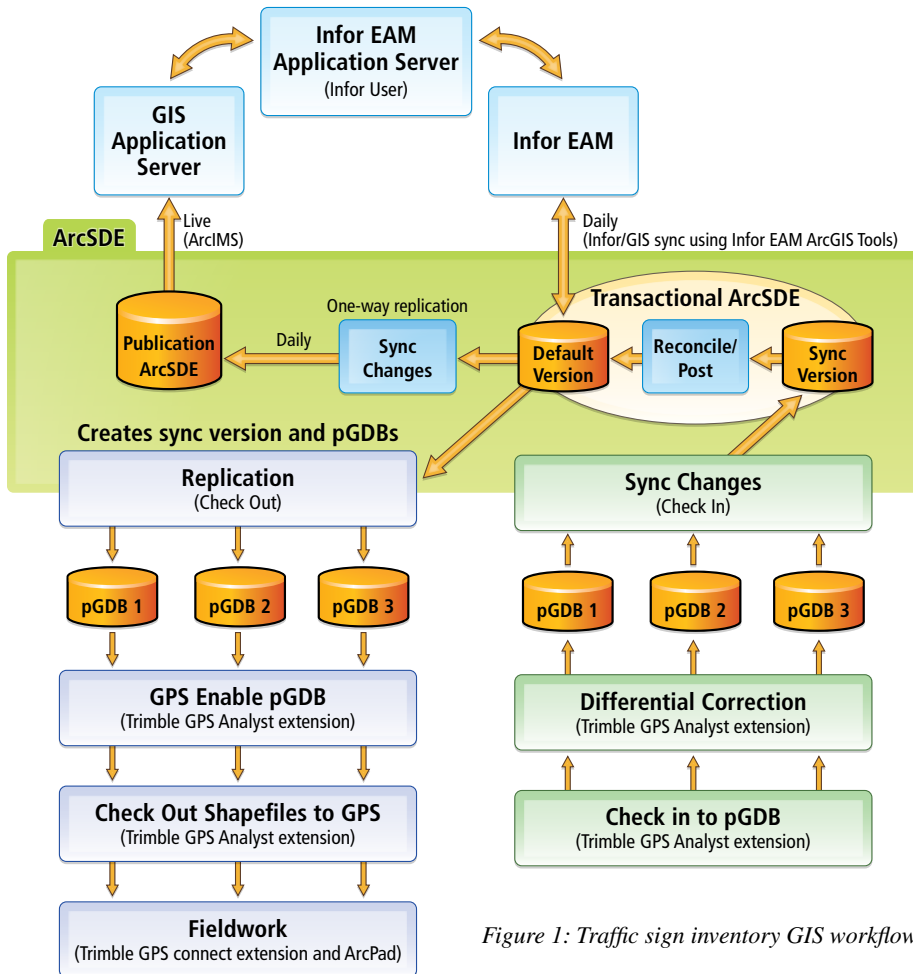


Figure 1: Traffic sign inventory GIS workflow



*With a staff of four field-workers, the Traffic Signs and Markings Division has collected nearly 10,000 street sign assets in just the first nine months.*

## 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.

## A History of Success

### Numerous GIS projects benefit Sacramento

The City of Sacramento, California, has a mature GIS program that has been in place since the early 1990s. GIS technology, applications, and data are widely used in all city departments and in many partner agencies in the Sacramento region. Many high-profile projects involving GIS have brought GIS awareness to city staff and the public. A few examples include 911/CAD/RMS (record management software) integration for public safety, the master address system, regional GIS, infrastructure management, solid waste routing, and emergency operations support. Accurate GIS data and systems support many critical business functions at the city and in the region.

Founded in 1849, the city of Sacramento has a population of approximately 450,000 and covers approximately 100 square miles. It is the cultural, educational, business, and governmental center of a four-county metropolitan region. The Sacramento region's economy is among the strongest in California.

The city uses a full range of ESRI software to support the city's business functions. Currently, ArcSDE is used to manage all enterprise GIS datasets. ArcPad running on Panasonic Toughbooks and Trimble GeoXT GPS units are used to collect and update GIS information in the field. ArcIMS is used to deliver published asset data, Web maps, and services to Infor EAM users to find and locate work orders.

The Traffic Signs and Markings Division also uses an ArcSDE transactional (read/write) environment to create disconnected versions of data for use in the field and ArcSDE replica and synchronization functions to check data in and out of the transactional ArcSDE and transfer data from the transactional ArcSDE to a publication ArcSDE (read only). The published data is then used by the Infor EAM system through the use of enterprise GIS Web services.



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## 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.

## Business Workflow Development

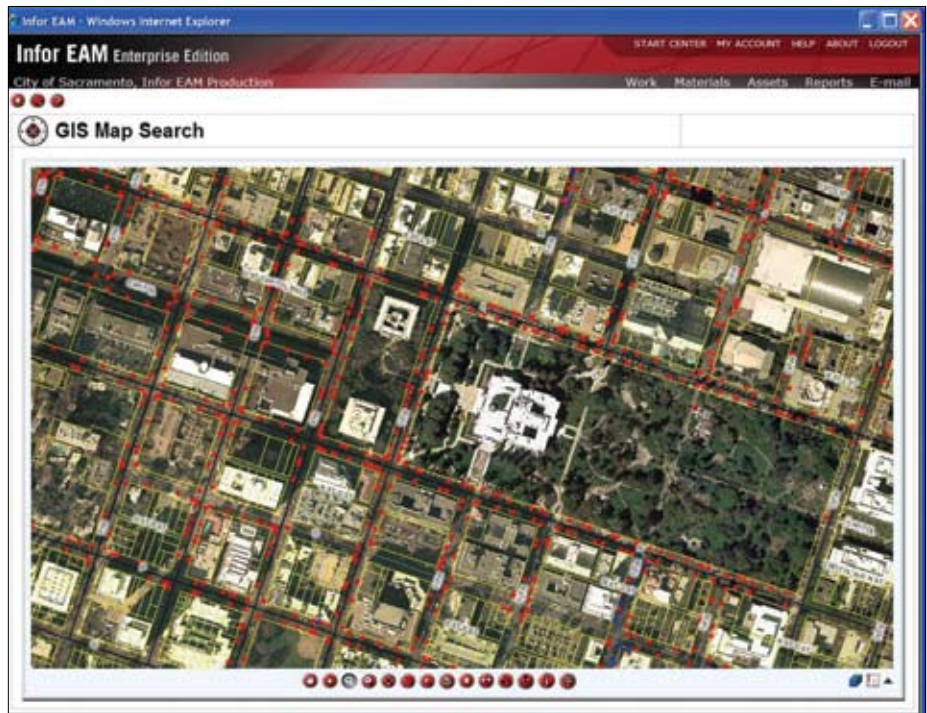
The Central GIS Unit met with the Traffic Signs and Markings Division and Infor to map out the business workflow that would inventory and maintain the traffic sign database that manages spatial edits in ArcSDE and work order management in Infor EAM. During the business workflow development phase, it 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.

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



*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.*

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.

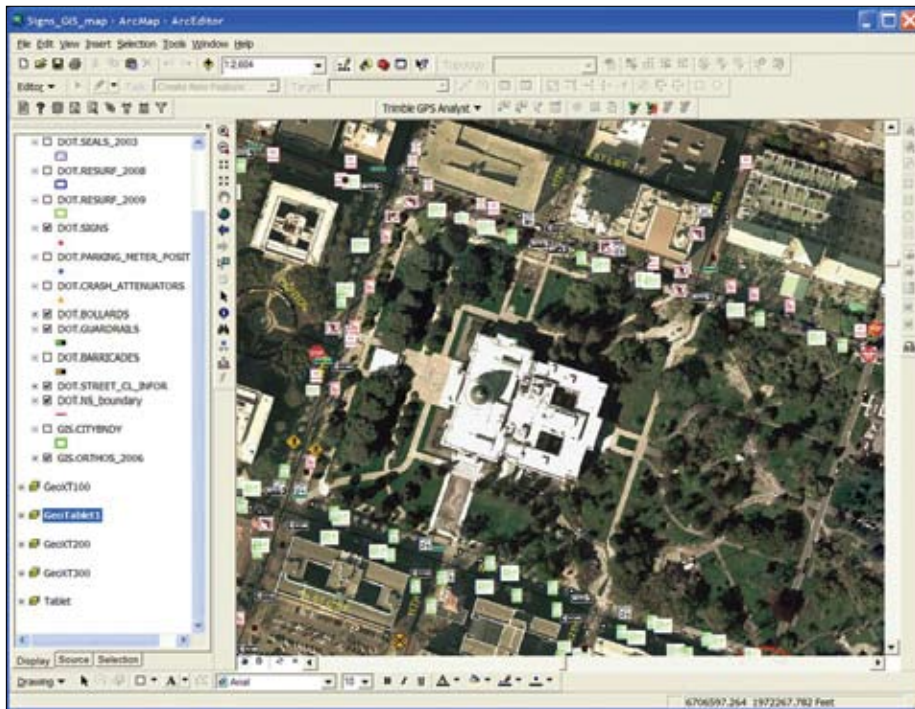
During the business workflow phase, the Traffic Signs and Markings Division decided three or four field people would be needed to collect and update the sign inventory. ArcSDE checkout replicas were developed to generate individual personal geodatabases for each GPS unit so sign data could be checked 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,



*Mapping street sign assets in ArcMap*

and other GIS analysts and their respective projects.

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).

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Ken Chapman, traffic worker for the City of Sacramento, Street Signs and Markings, Department of Transportation, and Maria MacGunigal, GIS manager for the City of Sacramento Central GIS Unit of the Information Technology Department, contributed to this article.

