# Municipal Asset Management with Wireless Data in Santa Mónica, CA

**In a laid-back California city, a Pocket PC-based GIS solution is revolutionizing municipal asset management.**

**By Michelle Maisto**

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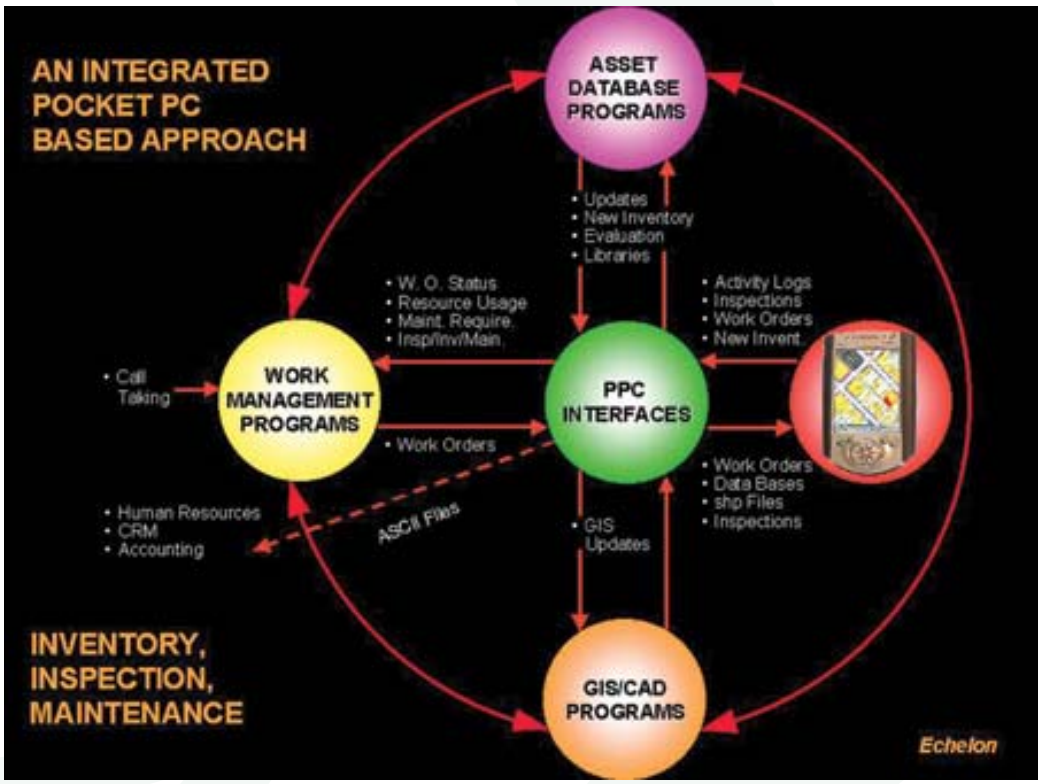
The city of Santa Monica lounges along the Southern California coast with the kind of golden sunshine, swaying palm trees and cerulean blue ocean backdrops that make Hollywood location scouts drool.

It's a tourist-heavy, jasmine-scented city with low-clipped public lawns and, on a clear day, a view that stretches into the Pacific past the thin, dark strip of Santa Catalina Island. However, not everyone sets their gaze so far. The eyes of Santa Monica's municipal maintenances crews, for example, are focused on the city's stretches of hot, gray sidewalks and curbs—all 235 miles of them—its 118 miles of streets, 651 alleyway segments and 16,000 parcels of land.

Like most cities' municipal maintenance workers, Santa Monica's are responsible for numerous daily tasks to ensure its upkeep. There is a maintenance crew for jobs such as weed abatement, sidewalk inspection and alleyway maintenance; another for graffiti removal; another to care for streetlights; and several others for myriad other tasks, all of which have traditionally been difficult to track and required daunting amounts of data entry. Not anymore.



In order to better manage its assets and fully comply with the Government Accounting Standards Board's (GASB) latest requirements for all municipalities, Santa Monica recently equipped its maintenance crews with eight Pocket PCs loaded with customized work management system (WMS) software and geographic information system-based (GIS) maps of the city.

As the field force implementation nears completion, the results already include: significant improvements in the monitoring and repair of city assets; more efficient response to repair requests and violations; immediate access to data on staff productivity, equipment use and supply consumption; and a 50- to 75-percent decrease in the time needed to produce and follow out work orders, collect and record field data and generate daily, weekly, quarterly and annual reports.

Not bad for a city most famously, and affectionately, known for being utterly laid-back.

**Plan of Attack**


"We used to do everything by hand," says Richard Valeriano, a city inspector and assistant superintendent. So when the time came to update to wireless, city officials worked closely with Raymond Rebeiro, president of Echelon Industries, a Diamond Bar, Calif.-based firm. Rebeiro has more than 35 years of experience implementing advanced technology for municipal, regional, state and provincial agencies.

The city's strategy came together over the course of three phases. Phase one consisted of a city-wide inventory of assets. The location and condition of each asset was identified and entered into an asset management system (AMS), and each asset category became a layer in the GIS on the workers' Pocket PCs. "Property boundaries, buildings, curbs—each one of those is a layer," says Rebeiro. "Trees, fire stations, parks, schools, street lights, traffic signs—even crosswalks, parking meters and parking spaces."

With the inventory complete, phase two concentrated on finding the right handheld system. Years ago the city started the move away from paper with ruggedized handhelds. "We got these old handhelds that were so rugged you could drop them on concrete from four feet," says Valeriano. "They were called 'the brick.' That's what we thought we needed. It was really rugged, but it had no map." It has since become clear that work crews needed something that could combine and handle several information systems—an AMS of 50, 60 or even 70 GIS layers, plus WMS producing different work requests and work orders for each city crew.

"We can't tell the streetlight crews to use the same software or database system as the traffic-sign crews," says Rebeiro. "They need different database systems." The new solution also had to be fast enough so that maintenance workers weren't forced to wait for the screen to update. Unable to find off-the-shelf software that met these requirements, the team chose custom software designed by Pocket GIS.

Phase three, the move to wireless, centered on the hardware. The Pocket GIS software can be integrated with nearly any existing asset management, work management or GIS, and it can be integrated with GPS receivers, laser rangefinders, bar-code scanners and digital cameras. The software can also operate on a number of Pocket PC devices, although the majority of Santa Monica's departments have settled on the Compaq iPAQ.

"We don't tell them what hardware they have to use; we give them a set of options," says Rebeiro. The traffic crew initially chose to work with Fujitsu PenCentra tablet computers because most of the staff preferred a screen that is larger than on most handhelds. Since then, the iPAQ and its brethren have been introduced, and now that the traffic crew has seen them, they want to switch to the iPAQs.

"The streetlight crews, maintenance crews and administrative staff are using iPAQs, notes Rebeiro. "Compaq has been very professional about their equipment, and we rather like that. In addition, the iPAQ is one of the few devices that can be read in bright sunlight; we have a requirement that every single piece of field equipment has to be usable in bright sunlight, as well as in the office." Rebeiro estimates the city might have 80 handhelds in use.

**Potholes Beware**

With inventory, software and hardware in place, the city has improved and streamlined its problem-resolution workflow. A typical scenario might go something like this: The city finds out about an outstanding issue. Maybe a citizen calls to complain about a pothole on her street or reports of a disheveled sidewalk come in from a routine maintenance inspection. At that point, a work request is created and submitted to the WMS via a desktop PC in an office. The WMS turns the work request into a work order, which is transmitted to the Pocket PC of the respective department leader.


Before heading to the location, workers can examine the site map on the Pocket PC to better ascertain what to expect or what materials they might need. Is the heaved sidewalk at an intersection? Are there old trees alongside it? When was it last repaired?

"You can jump to any part of the city in a few seconds by basically telling the database to 'Find this particular object'," says Rebeiro. "You can find something as large as an intersection or a ballpark, all the way down to an individual traffic light or streetlight post. Once you're at that spot, you can then see the assets and the characteristics of each one. For example, it's a traffic sign and it's an R1, which is a stop sign. You know when it was installed and when it was last maintained. Then you can start recording all your activities."

After the crew tends to the problem, the team leader updates the worksite's status on the Pocket PC. At the end of the day, the device is cradled and hard-wire synchronized with the servers, enabling the updates to the ADS, WMS and GIS.

The new data must also be reconfigured because several applications rely on this information. "We have different sets of programs that all need to talk to the iPAQs, so we've developed something like a universal translator." Dubbed FRAIMES, for field recording asset inventory maintenance system, the middleware accepts data from the WMS and the iPAQs, reconfigures and funnels it to the appropriate back-end applications and channels new information back to the iPAQs. "It's the interface between the iPAQs and what goes on in the office," adds Rebeiro.

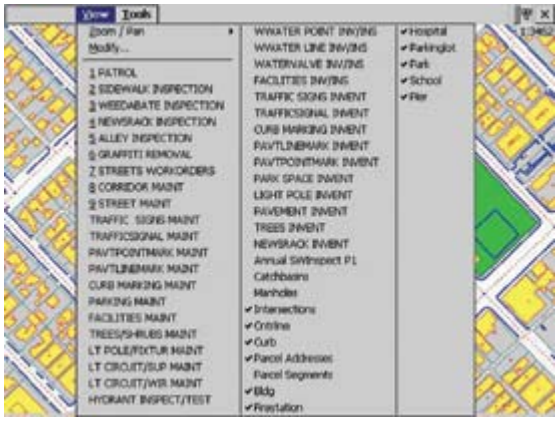
**Corrections Department**


Accurate data is critical to the efficiency of the databases. To ensure that data entry in the field goes as smoothly as possible, the software was designed to be hierarchical—by choosing A the options for B are defined, by choosing B, the options for C are defined, and so on.

"We didn't want the city staff using keyboards, and we didn't want them entering anything other than what we have in menus," explains Rebeiro. "They have to be able to do everything by selecting from menus. All they're doing is [choosing from options], so there are fewer errors."

According to Rebeiro, a pothole repair might flow something like this: A crew could be doing the work with concrete or asphalt. If it's asphalt, the possible types of tasks are different than those that can be done with concrete. When the asphalt task for potholes is picked, the materials become selective. Then when asphalt is picked, the quantity of the materials, in terms of tons or square yards, is defined for the user. As the worker makes further selections, his choices are constrained. "It makes it very difficult to make a mistake," says Rebeiro. "Someone can't come back and say they poured slurry and measured it in tons, because slurry is measured in gallons. We needed the software to be foolproof in that respect."

While the GIS-equipped handhelds are certainly helping the city meet GASB standards, the rewards of the system go far beyond this checklist. Benefits can be found in each step of an operation. For example, for a job such as weed abatement, the handheld is helpful in several respects. If an inspector finds that a property is overrun with weeds, he can use the digital camera on the iPAQ to take photos to include in the property's file and update the asset database. The iPAQ stores each photo and files it according to the property. If an inspector photographs 10 properties that day, (no matter how much the weeds all begin to look alike) there is no question about which photos go with which address.




The benefits are certainly not confined to the field, according to Valeriano. "From the office perspective, it makes our work much easier. With weed abatement, for example, once the is data electronically stored in [the handheld], the database will perform a lot of the legwork. We can find out who owns the property and the last time it was repaired; it's so quick. So when we send out our form letters and certified mailings, and do our reports, we're way ahead of the game."

Valeriano is also adding revolutionary advancements to the mapping application. According to Rebeiro, Valeriano has been instrumental in developing rubber sidewalks. "Sidewalks are typically concrete slabs. But if you grind down old tires, you can make slabs with them. It's one way of getting rid of tires, which are an environmental problem, and rubber sidewalks don't heave as much and are friendlier toward trees. But before you start using rubberized sidewalks, you need to know where your trees are and the condition of the existing sidewalk." For Santa Monica's crews, it's all in the system.

**Cover Your Assets**

"What we've discovered—and what a lot of municipalities don't pay attention to—is that if you integrate the information for the sidewalks, trees and streetlights, you can do a much better job of maintaining all three," Rebeiro says. "For example, when you put trees very close to streetlights, the trees grow faster because they have more light. A streetlight has a high-pressure sodium lamp—the kind of light trees love most. Also, certain kinds of trees heave sidewalks more than others. By knowing where the trees are, what kind of trees they are and how old they are, you can assess what will happen to the sidewalks."

The same goes for integrating asset management information concerning traffic and traffic patterns, says Rebeiro. When workers conduct pavement inventories, they can track factors such as the texture, and if the aggregates are popping out of the road surface. When workers do street inventories, they can gauge entrances, exits and streetlight locations. When combined with traffic speed and accident data, patterns quickly emerge. "You can see that you're getting more accidents where the road is wet because cars are slipping more on polished aggregate." The right tools allow the connections to become clear, which means timely adjustments and repairs can be made.

"You now have the ability to start integrating the asset information, which means you can do a better job of analyzing your maintenance needs," says Rebeiro. "You can justify your expenditures better. The bottom line is you can do a better job for the public."

**Setting the Standard**

The Governmental Accounting Standards Board (GASB) monitors the financial reporting methods of state and local governments. In June 1999, GASB turned regional governments inside out. The board proposed a new initiative, GASB34, to better reflect the way current public infrastructure is accounted for, consequently making financial reporting easier and more comprehensive for the local agencies.

The GASB34 standards require an infrastructure asset management system that follows three requirements:

1. An up-to-date inventory of eligible infrastructure assets.
2. The performance of condition assessments of eligible infrastructure assets every three years and summaries of the results using a measurement scale.
3. Estimates of the annual cost of maintaining and preserving the eligible infrastructure assets and the level established and disclosed by the government.

Handheld, GIS-based asset management systems, such as the one being used in Santa Monica, will likely be adopted at a faster rate by municipalities across North America as they invest in and better handle their assets to meet the specifications of GASB34.

"Government agencies have historically not dealt with their assets for a number of reasons," says Ray Rebeiro, president of Echelon Industries. "Throughout North America, municipalities have billions of dollars in assets in poor condition. We're in this mess because accounting standards didn't force us to record assets and their conditions. Now we have to change the way government and municipalities do their accounting to deal with an understanding of their assets.

"Cities like Santa Monica are saying, 'If we understand what assets we've got, and we maintain our assets properly, we've got GASB34 under control.' "

*—Michelle Maisto*

**First Steps/Next Steps**

Rolling out high-end technology, such as a Pocket PC-based GIS solution with dozens of mapping layers might seem like a slam-dunk on paper. But unless you can convince your blue-collar users to accept it as part and parcel of their everyday work, you're going to end up on the bleeding edge with boxes of expensive shelfware.

In Santa Monica, user acceptance is high, thanks in part to the workers' familiarity with previous handheld-based projects, notably with Norand 4000 series devices. "It only had four megs of RAM, so we couldn't run the GIS on it," recalls Richard Valeriano, a city inspector and assistant superintendent of maintenance. "But the Norands, which we used for more than three years, gave the inspectors and workers great experience in data collection. They all figured out how to relate to work descriptions, job types and categories appearing on drop-down lists. That was a major shift in thinking about work."

When Santa Monica upgraded to Compaq iPAQs, training became vital, particularly in the field. "You don't know how people are going to accept it," Valerio says. "You have guys filling potholes who don't have much computer experience, so you have to really think ahead about how you're going to train people, how you're going to introduce them to the system and how they'll be using it."

Training was accomplished in phases. First, inspectors were introduced to the GIS on the devices during the city's annual sidewalk inspections. Valerio personally began training his colleagues. "The sidewalk inspections are very repetitive—an inspector does about 150 per day, so the learning curve was about two days to produce a well-trained end-user," he explains.

Next came training for the work crews, which occurred in three phases. First came a classroom session to introduce workers to the handhelds and the Pocket PC operating system. After a morning of text-recognition games and voice recording, phase two focused on Pocket Systems' Pocket GIS application and navigation techniques. Workers also practiced data entry using the new street maintenance application, including capturing "point data" such as streetlight locations.

Finally, after the crews worked with the iPAQs for a few weeks in the field, Santa Monica brought in an outside developer for a day of training. "We all learned a great deal that day because the professionals were able to show us the full range of power of the handhelds," Valerio recalls. "After all, they are computers."

The final phase of the training, focusing on the managers, is currently in progress. Managers are learning how to create reports, generate maps and implement the CarteGraph Workdirector application to run the maintenance division's operations using the information compiled and uploaded to the database. The system is designed to accept work requests, convert them to digital work orders and download those orders to a specific iPAQ assigned to a specific crew. Using this feature, workers will not have to capture a point; the point will be downloaded to the handheld by the manager using preconfigured information. The worker will only need to open each point to get to the input form underlying the point, where they will then enter the necessary data.

"Managers are also leaning to relate one application to another," Valerio explains. "The sidewalk inspection app can read the street maintenance app. These two form a relationship that updates the checked sidewalks in the inspection data and receives work requests from the sidewalk inspections, which can then be converted into work orders and sent to the field crews."

Santa Monica's next step: To go wireless and increase the speed of all field operations.

*—Michelle Maisto*