Editor's Introduction

In this issue of *GIS Monitor* I report on a conversation with Erich Seamon, San Francisco's Geographic Information Officer, about that city's use of GIS for emergency planning and response — a topic particularly timely today, in light of the terrorist bombings in London and the consequent tightening of security in U.S. cities. I also bring you my usual roundup of industry news from press releases.

— Matteo

GIS for Emergency Response in San Francisco

San Francisco, which has a population of about 800,000 and covers about 49 square miles, began an enterprise GIS five years ago, under mayor Willie Brown. Erich Seamon, the city's Geographic Information Officer, told me that San Francisco's 65 departments and 27,000 employees were using GIS in "nonstandard" ways and the Brown administration wanted to standardize GIS applications and procedures "without taking away ownership from the departments." According to Seamon, "A lot of departments had GIS information, but only a few had created an enterprise system for themselves. A few of the bigger agencies had a server or two. We snuck in before many of the departments were so far down the road [of GIS development] that they did not want to participate in a city-wide system." The new enterprise GIS focuses mostly on Web services, though it also enables city staff and the public to download raw data.

I asked Seamon whether his shop is responsible for maintaining the city's emergency deployment plans. No, he told me, that is a responsibility of the city's Office of Emergency Services and Homeland Security. "Our enterprise GIS is in another agency — the Department of Telecommunications and Information Services. We provide technical support to emergency services, but we do not develop plans for them."

What kind of wireline and wireless access do police, fire, and EMT personnel have to the city's GIS? "We have a city-wide network that they can access via a Web browser or via a GIS client," Seamon told me. The city also has a limited WiFi capability, but it is not specifically intended for use by emergency services. Due to strong concerns about data security, GIS access is primarily via wireline connections. So, I pressed him, city staff do not yet have wireless connectivity? "Yes," he acknowledged, "we have problems with that. We are not currently pushing real-time updates to officers in the field. But we are looking into it." Command centers, on the other hand, may have hard

connections and be able to access GIS data and applications that way. “We also load GIS data and applications on individual devices used in the field,” he added. “However, this is less for use by first responders and more to collect information.”

What mobile hardware and software do city staff use? “We were using iPAQs but we moved away from them because they are small and hard to read. Now we are looking at more heavy duty Windows XP devices, such as tablet PCs. We want a more robust operating system [than what PDAs use].” City staff use ESRI software, mainly ArcGIS and ArcPad. However, Seamon told me, “We are looking to move away to something we can develop on our own, such as VisualStudio.NET and VisualBasic.NET for Windows applications, or the equivalent for Web applications. Of course, this assumes Web access, which is still problematic.” Given the choice, Seamon would much prefer to develop Web applications, accessed through a Web browser, rather than GIS applications running on staff’s local machines. “Security is currently the hurdle, because emergency personnel use extremely sensitive information.” While he feels “very confident” in the security of the city’s servers and wireline networks, wireless connectivity is another story — especially given that there is no citywide WiFi system. “We have to use other providers. Someone could snatch a data packet off from the air. Our first responders want to make absolutely sure that their information is secure.”

What kind of training do emergency personnel have in the use of GIS? “We’ve done minimal training, such as ESRI training for public safety personnel, but still have a lot of work to do.” The police, Seamon told me, use GIS mostly for crime analysis — not in the field. “The lack of training is holding all the agencies back [from greater use of GIS]. We could do a better job at that.” City staff who do use GIS on mobile devices “have been trained on the devices and have had minimal training on GIS technology. You have to train them continuously, until they feel comfortable using the devices, or they will not use them.”

What kinds of technical assistance does Seamon’s agency provide to field personnel during an actual emergency? “We do regular disaster drills, table-top exercises. From a GIS perspective we are fairly well engaged in that. If an emergency were declared, analysts would report to command centers.” GIS analysts are part of the city’s emergency planning teams and GIS information supports personnel in the field. “The technology is at the back end, at the command centers.” What software do GIS analysts use during field deployment? “They would use the full suite of ESRI software — plus FME or other metadata translators, XML editors, and other third party software to support the executives in charge.”

I asked Seamon for a recent example of GIS use in an emergency. “Most recently we had a tsunami warning,” he told me, “but an emergency was not declared. If one had been declared, GIS analysts would have reported to emergency operations command centers. They would have created inundation

layers and pushed them out to the network." First responders would not have had direct access to these layers, he clarified, unless they had a wired connection. However, requests from the field for specific GIS products would come in to command centers and be passed on to GIS analysts. Requests for other kinds of support would arrive via the E Team collaboration portal software that the city uses to manage crises. "For example," says Seamon, "someone might write 'We have a shelter and we need 100 blankets.'"

What are some of the biggest technical challenges of operating a GIS during a city-wide or large-scale emergency? "You know," Seamon told me, "San Francisco is somewhat unique. We have a small but high-profile jurisdiction, so we have very robust data. Our challenges are less around the data [than is the case in other cities]. We have technical challenges and then we have organizational and political challenges. Often the latter are more difficult than the former." According to Seamon, the city has redundant servers, mirrored data, and very strong network architecture and metadata. However, "during an emergency, the challenge is about how people use the information. For example, during an exercise, we had a map service displayed on the large screen in the command center — but the police were huddled around a paper map and were drawing on it. The technology did not suit their needs at the time."

"We do have technical challenges — such as pushing information out to first responders wirelessly and problems with mobile data terminals that don't allow everybody to look at the same maps." Nevertheless, Seamon stresses that the biggest hurdles are organizational and political challenges. For example, convincing executives of the importance of continuously training staff in the technology, so that they will actually use it in an emergeny. "Even though GIS has been around for a while, it is still perceived as a complex technology." Another organizational challenge is that each city department is focused on its own needs and responsibilities, such as putting out fires, so "they may not like to conform and may not have a lot of incentive to share data."

The city has a lot of heterogeneous data that becomes valuable when combined with geospatial data. An example is fire inspection information stored in a database at the fire department. The challenge is to mine it and geocode it for 60, 70, or more types of information. "From a regional geospatial level we've been interested in a Google-type search for metadata," Seamon told me. A step in that direction is the Bay Area Regional GIS Council (BAR-GC), an effort funded by the National Geospatial-Intelligence Agency (NGA) to integrate geospatial information for nine counties in the Bay Area and push it out as a Web service. "We have four redundant sites in the Bay Area. The information is replicated every day in all four sites and if any of the data were destroyed we would automatically re-direct users to another site." ESRI, the National Geodetic Survey (NGS), and the U.S. Geological Survey (USGS) have been extensively involved in this effort. The federal government likes it because

it sees regional data sharing as a first step toward national data sharing. “Regionally,” says Seamon, “is the best approach for data sharing. Eventually, if you have a standard regional model, you can patch all the regions together.”

While San Francisco is rich in geospatial datasets, the challenge, according to Seamon, is to mine all the dynamic attribute information and combine it with GIS. “If it were all in one system,” he told me, “it would be much easier. Even though we have an enterprise GIS, that doesn’t meant that all the relevant attribute data is integrated. Integrating it presents a technical challenge in terms of the network, the databases, connectivity, application interactions, etc.”

Finally, I asked Seamon what technical developments — in hardware, software, data, and/or communications — would most help him with GIS deployment in a crisis. In short, what’s on his wish list? He told me that his office wants to become more proficient in developing its own applications, particularly Web services, and expanding access to its technology and data. He wants to develop map services that generate XML that can be dynamically consumed by other mapping APIs, such as Google — rather than having to download data and overlay it on maps. “That and peer-to-peer networks are key areas of development.” Ultimately, Seamond believes, the biggest constraint is the limited supply of smart people. “Having good analysts and developers is critical,” he told me.