Applying GIS Mapping--What It Can Do for Wireless 9-1-1

By Jerry Merlick

Most of us recognize that first, wireless 9-1-1 is a reality, and second we as 9-1-1 professionals are required to prepare accordingly to provide the best possible solution in responding to wireless 9-1-1 calls. In addition, it's also widely recognized that perhaps the best solution available to wireless 9-1-1 calls involves some type of geographic information system (GIS). The questions surrounding wireless 9-1-1 entail the actual implementation of GIS for Phase I and II solutions and include more detailed and technical aspects of the realization of wireless 9-1-1. To help you close the gap on facets regarding the relation of GIS and wireless 9-1-1, this article offers an applied example of a successful wireless 9-1-1 deployment, while providing a guideline for the implementation of a GIS solution for wireless 9-1-1.

The Building Blocks of Wireless 9-1-1

As with the automatic location information (ALI) database and traditional 9-1-1 equipment and software, a system is only as good as the data behind it. When the issue of how to prepare for the implementation of wireless 9-1-1 was just starting to gain momentum in 1997, the El Paso/Teller County 9-1-1 Authority system manager, Jim Anderson, knew it was not a task to be taken lightly. He started a project that involved investigating and developing a solution for responding to wireless 9-1-1 calls. Initially, a study was performed to identify areas that could be leveraged to his agency's advantage, therefore saving resources and time.

Essentially, agreements with local public agencies were developed that would allow for the 9-1-1 authority to use local GIS data for 9-1-1 use. The project then exploited a global positioning system (GPS) solution for the collection of missing street centerlines to insure all streets were located within the database. In addition to streets, parcel data was leveraged to generate addressed point locations, not only for use at the PSAP map, but also for eventual ALI database analysis.

Additional GIS layers were obtained and/or generated on an as-needed basis. Due to the number of recreational activities for residents and visitors in the surrounding mountains, relevant place name and landmark information was needed for use by 9-1-1 call takers. This data was obtained from the United States Geological Survey (USGS) GNIS database and stored with other localized commonplace information.

The various data layers, hard work and persistence developed a highly accurate GIS database that created the foundation of a wireless 9-1-1 solution. It must be stressed that accurate data is a necessity in a wireless solution—if the information is not correct, the 9-

1-1 call takers will not trust that the GIS software and mapped information will provide accurate information in critical moments.

Wireless-specific Data

Certain GIS data layers are required to be developed in order to provide a wireless GIS solution at the PSAP. These layers include a cellular tower sector coverage layer that is used when the Phase I ALI is received by the 9-1-1 software, and an emergency service zone (ESZ) map layer. The cell tower data layer provides call takers with location information concerning a 9-1-1 caller, which is otherwise unavailable. The ESZ data layer helps call takers identify the response configuration for the wireless 9-1-1 call, including law, fire, and EMS.

Certain actions were taken at the El Paso/Teller Authority to use both the cell sector data and ESZ data for real-time wireless 9-1-1 calls. First, a request was made to each wireless carrier database provider to slightly alter the wireless ALI data stream to allow for a unique identification of every sector. Colorado uses a non-call associated signaling (NCAS) solution for providing the wireless ALI data stream, and therefore, a unique 10-digit alphanumeric identifier was assigned by the carrier to each cell sector. Adding the unique identifier to the front of the tower address altered the address portion of the ALI exclusively. For example, an address that once was "1 Cell Ln." now reflects "375450AWS1 1 Cell Ln." This was essentially the assignment of a pseudo-ALI.

In addition to altering the wireless ALI delivered to the PSAP, each wireless carrier was asked to provide a spreadsheet containing each tower sector record. This spreadsheet was used to automatically generate the tower sector GIS data layer using 9-1-1 GIS data development software. To use the sector data layer for 9-1-1 calls, the mapping software located at each call-taker workstation was configured to select the first 10 digits of the address portion of the ALI record when a wireless 9-1-1 call is received. The selected sector is then displayed on the map, including all address points, street centerlines, and corresponding ESZs that fall within the boundary of the plotted sector. When Phase II is implemented, the same software will recognize a latitude and longitude coordinate and process this information accordingly. The functionality of the cell sectors will remain an important redundancy in Phase II for locating callers when latitude and longitude are not delivered with a wireless 9-1-1 call.

The PSAP Map

There are a number of available PSAP mapping software products available today, many of which are integrated into computer aided dispatch (CAD) software. Be advised that not all mapping software is created equal. The most effective PSAP mapping software should have, at a minimum, the following features: Phase I and II capability, highly refined geographic entity search functionality, response configuration display for the various emergency service zones, the ability for users to electronically record erroneous ALI records or GIS data, latitude and longitude search functionality, direct integration with 9-1-1 and/or CAD software, support for aerial photography or satellite imagery, and fully customized GIS layer symbolization. Having these attributes, as well as additional functionality, will bring high regard from call takers and other public safety personnel.

The Other Side of 9-1-1 GIS
While the ultimate goal is to provide a solution for locating wireless callers and ultimately save lives and property, there are a variety of ways in which the development of a 9-1-1 GIS will also serve. For example, maps are valuable tools for use in the field. The developed GIS data can be used in mobile data terminals (MDTs), or to produce a paper map atlas book that can be kept in an emergency vehicle.

The GIS data can also be used as a "checks and balances" system to the otherwise strictly tabular 9-1-1 databases. The GIS data layer for street centerlines can be compared to the MSAG to identify any addressing discrepancies in either data set. After fully matching the MSAG and the streets, an ESN data layer can be generated to spatially represent the response configuration of the member emergency response agencies. If addressing point locations of buildings are entered into the GIS, this data layer can be used to locate records in the ALI database that need correction, and vice versa. The tabular CAD geofile can also be compared to the GIS data to guarantee accurate location data resides in the CAD system, and can be reliable when the addressing data trickles down to crime analysis, resource allocation, and/or the courts records management database.

Maintenance is Key
Data developed today is inaccurate tomorrow… The idea of developing your GIS data, or purchasing data from a vendor, will potentially provide you only with a database that is accurate until a new house or street is added. Another manner in which data will continually change is when parcels of land are annexed from neighboring municipalities, which will ultimately alter the response area for a member emergency agency. For these and other reasons, careful consideration must be made to ensure your wireless 9-1-1 GIS database continues to be accurate, and trusted to provide the correct response to roaming wireless 9-1-1 dialers.

Solutions regarding GIS data maintenance typically involve GPS, some form of cooperation with the planning and/or enumeration departments, and local exchange carriers (LECs). Suggestions simply include the development of an approach to ensure the flow of information from these key departments and companies to the 9-1-1 management office. In addition, commercially available, 9-1-1 specific GIS software is available that will perform the collection of new streets, the assignment of new addresses, and the comparison to telephone company databases such as the MSAG.

Make a Plan
It's not too late to prepare for Phase II. If your agency has not deployed Phase I yet, make Phase II your target. First, develop a plan by discovering your available resources and options. These options involve data, software, hardware, budget and people. You must have a starting point and solid plan of action. Assign a qualified person or hire an outside consultant to evaluate what exists and what it will take to roll out a wireless solution to the PSAP. After the development of a plan, either perform the work in-house, seek outside assistance, or maybe a little of both. Remember that you can always have an

initial implementation and continue work to improve the GIS data over time. The best advice is if you have yet to develop a wireless solution, don't wait any longer.

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The El Paso/Teller 9-1-1 Authority agency is located in Colorado Springs, CO and manages 10 PSAPs in a two-county jurisdictional area. The PSAPs vary from one call-taking position to seventeen. They can be reached on the web at www.elpasoteller911.org or by calling 719-578-1900.