ArcGIS Server and ArcGIS Mobile Help Officials Monitor Events and Respond Faster to Emergencies

City of Dover, Delaware, Deploys Groundbreaking GIS Application for NASCAR Events

By Jesse Theodore, ESRI Writer

The weekend of May 30–June 1, more than 140,000 fans will line "The Monster Mile" in Dover, Delaware, to whistle and cheer as they urge on their favorite drivers during three days of NASCAR races.

But while others focus on cars traveling at speeds up to 150 miles per hour around the track at Dover International Speedway, public safety officials will be busy watching for problems and ensuring a safe, secure event. And as medical emergencies, disturbances, and code violations are reported, officials will rely on geographic information system (GIS) technology to help them respond to, manage, and coordinate activities faster than ever before.

Managing a City of Race Fans

One of the toughest tasks for local government agencies is managing large-scale events. The City of Dover (population 35,000) has a particularly unusual public safety issue. Twice a year, the city hosts major NASCAR races. The city's population

NASCAR fans gather for the races at the Dover International Speedway in Dover, Delaware. Photograph by Reinhold Matay.

A map of the overall operational area with a 2007 aerial photograph.

swells to more than 200,000 as fans from all over the United States descend on Dover.

This creates an enormous challenge as local government officials work to protect the many temporary residents visiting the area. Staff and resources come from the fire, health, emergency medical services, law enforcement, public works, and utilities departments and agencies.

To help coordinate every aspect of this vast operation, the City of Dover recently deployed an advanced enterprise GIS platform that gives venue managers the ability to access data and visualize what's happening where at Dover International Speedway. GIS also lets them capture, integrate, and analyze important public safety data, which helps them respond faster and more efficiently

to emergencies or other problems. The enterprise solution was successfully used during the NASCAR races that the speedway hosted in June and September 2007.

GIS technology allows event managers, stationed in the Kent County, Delaware, mobile command center next door to the speedway, to view digital map displays of the entire race venue including the track. On the digital maps, the managers receive information concerning incidents and crowd activity.

Using ArcGIS Server and ArcGIS Mobile software from ESRI, staff operating in the command center and in the field can visualize where disturbances, code violations, accidents, and other incidents occur.

This view of the entire race, with real-time event data being posted by field personnel using ArcGIS Mobile, provides the command center with a common operating picture that can be shared with other personnel in different locations. The server-based GIS provides an enterprise platform that can be accessed using browser-based desktop or mobile clients. It makes extensive capabilities available without having to install any special client software and without training.

As users in the field—such as fire marshals or personnel in a Dover Fire Department command vehicle—collect new data about an incident, they can move into a wireless hot spot that allows the data to be quickly fed to a server at the command center. As data is received, the updates are integrated into the GIS database and pushed back to mobile devices. Staff with the mobile clients can see the updated locations and related data about incidents on a digital map. The command staff can then better determine where, how, and how many staff members and resources to deploy to situations.

"Overall operational awareness is the greatest benefit to this project," says Mark Nowak, GIS coordinator for the City of Dover. "All aspects of the operations are greatly improved using GIS. Communications are improved because now everything goes through the mobile command post on race weekends and decisions are made using information collected in the ArcGIS NASCAR event solu-
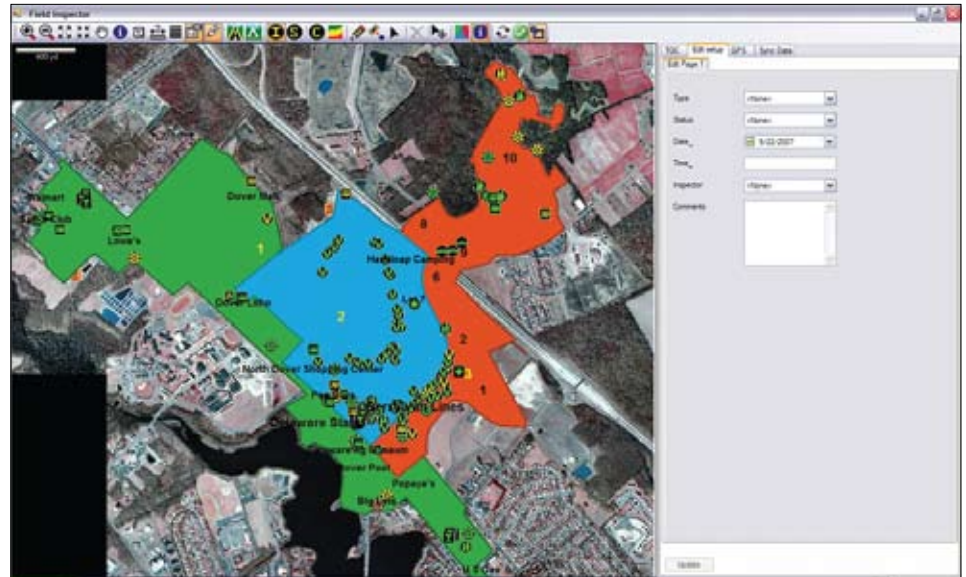
A view of the overall operational area in and around the Dover International Speedway, with the operational divisions marked and different types of incidents appearing as symbols on the map. For example, the V symbols mean vendor violations. If they are marked in green, the problem has been solved. A yellow V means officials are still working to resolve the situation.

tion. Prior to this, decisions were made by field personnel without a clear understanding of the overall operational picture."

Dover Expands the Use of GIS

For years, the City of Dover had successfully used

The V symbols indicate vendor violations, usually signifying the vendors did not have a license. The symbols that show people walking indicate calls for assistance, such as someone asking for directions.
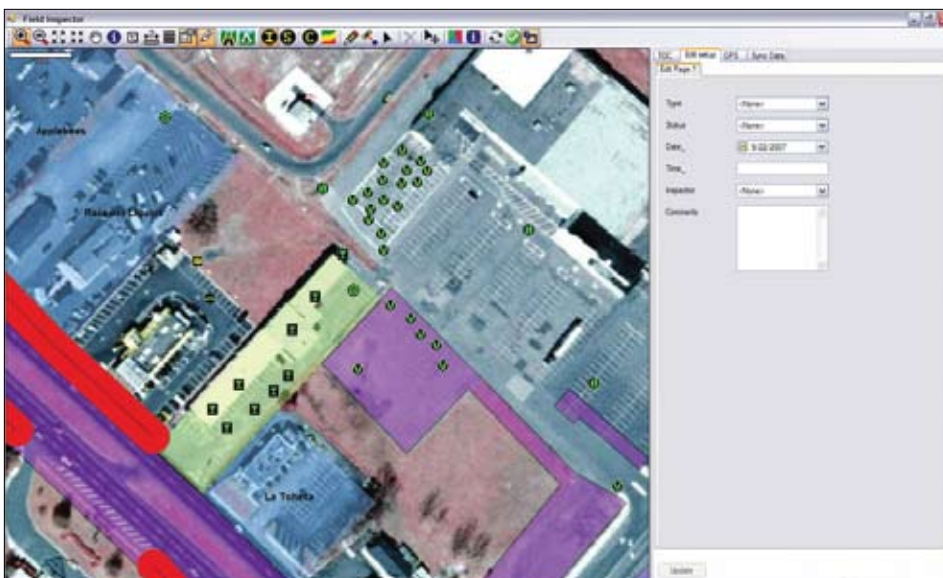
ArcGIS 9 software from ESRI, including ArcSDE, ArcInfo, and ArcGIS Desktop software, in departments such as planning and development.

In 2006, the city implemented mobile GIS—ArcPad from ESRI—to enable its fire marshals and other public safety staff to move throughout several large camp areas and have remote access to a comprehensive database. The application to assist in managing the NASCAR event was the next step in the city's overall GIS development.

The city took the next step in its GIS path in 2007, when it deployed ArcGIS Server and ArcGIS Mobile. ArcGIS Server gave the city a more cost-effective, easy-to-deploy means for supplying GIS capability across the government enterprise. ArcGIS Server applications are used by city planners, public safety staff, and others.

Keeping NASCAR Fans Safe

With its roots in the southeastern United States, NASCAR has grown to become one of the nation's most popular professional sports. The nationally televised sport has garnered millions of fans and many Fortune 500 corporate sponsors. It's an entertainment phenomenon, and people travel many miles to partake in the festival-like atmosphere that surrounds the races.

Many of these fans stay in campgrounds owned by the speedway or private operators. The city monitors this community of race fans, responding to any code violations, rowdy parties, reports of illegal fireworks, or medical emergencies.

"Having an overall visual locational awareness of the entire operational area keeps people safer," said Nowak. "Because of our detailed and accurate mapping of the area, personnel working during the event do not have to rely on institutional knowledge of their own or someone else's to locate areas, equipment, or access points. We have all the campgrounds mapped—some down to the actual spot the RV will be parked."

For the June 2007 NASCAR race, the City of Dover needed to plan for and monitor 25 campgrounds, multiple outdoor activities, and 55 acres of vending areas. The city had access to approximately 30 layers of GIS spatial data at the command center and in the field including building footprints, elevation contours, parcel data, and county address points. An additional 17 layers related to the NASCAR event were available. Approximately 95 percent of GIS layers the city used were created and maintained by the city's GIS group. All NASCAR event layers were created inhouse as well.

Some of the NASCAR geodatabase layers included the following:

- Camp Road Centerline
- Campsites
- Center of Speedway
- Speedway Gates
- Emergency Operations Areas
- Hydrants
- Incidents
- Outdoor Events
- Power Lines
- Code Violations
- Substations
- Vending Areas

Associated with these layers is attribute data such as contact information, recreational vehicle (RV) capacities for each campground, camp road numbers,
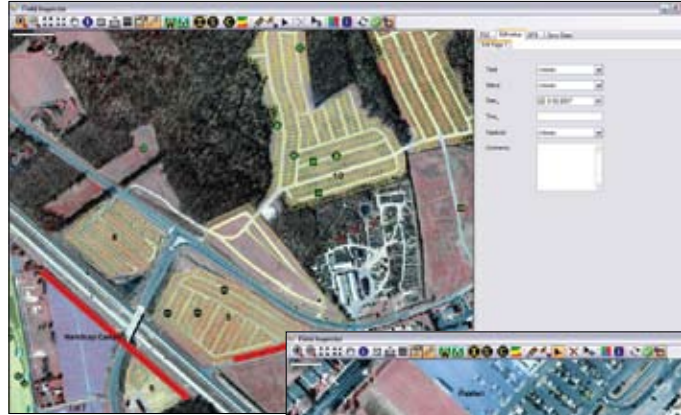
A view of the campgrounds with a variety of symbols mapped such as small fires. A camper symbol usually means that two or more campers are parked closer than 10 feet apart, which violates regulations. The badge symbol indicates a code enforcement issue.

This map shows a fire lane code enforcement violation in the Sam's Club campground.
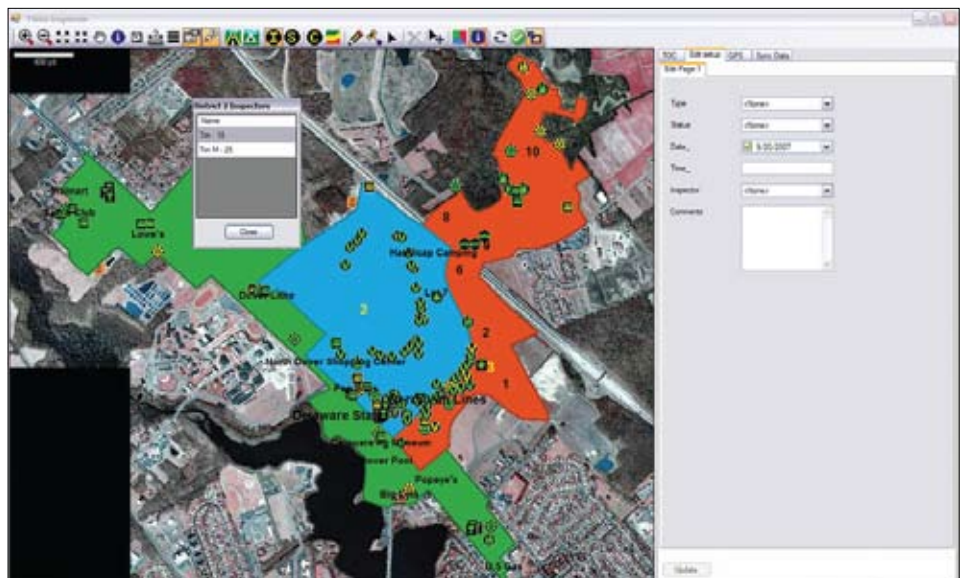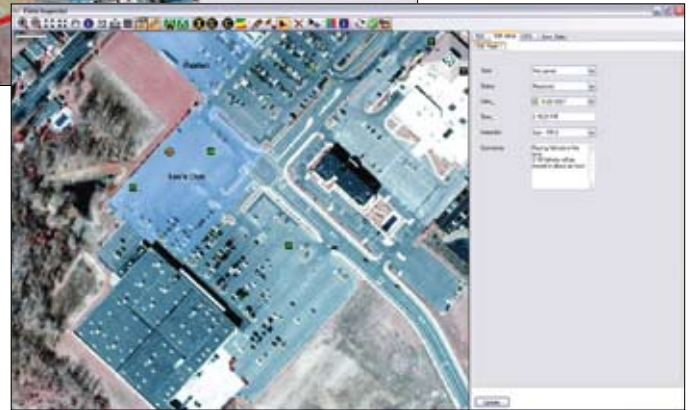
The display on this map shows the assignment of inspectors to operational divisions.

parcel ID numbers, and ownership data. The campsite layer was obtained in CAD format through a consultant working for Dover International Speedway. The consultant used CAD to create a map that was campsite specific. The city requested the CAD files, converted them to polygons and ran topology to fix all the errors, and converted them to a feature class format.

ArcGIS Server acted as the enterprise application platform and ArcGIS Mobile acted as the mobile field client. Prior to the start of the race, aerial photographs of the area were integrated with digital street data and campground locations. Staging areas for emergency medical services (EMS) staff, health centers, and law enforcement were established. The city could use the spatial data to outline perimeters for vendor locations.

GIS technology and spatial data helped meet the informational requirements of government officials who must enforce several local code regulations. GIS applications allowed fire marshals in the field to orient themselves with where they were and where they were going while allowing them to access and capture data remotely and in real time.

For instance, a customized drop-down menu in ArcGIS Mobile provided a list of code enforcement options, such as "fireworks." Once an incident takes place, such as the use of fireworks in an unauthorized location, a fire marshal can click a button to capture the x,y coordinates of the incident, providing instant incident geo-referencing. The fire marshal can then select the appropriate incident option from the drop-down menu and input any pertinent information into a comment box such as whether or not a citation or verbal warning was issued. This spatial data adds to the fire marshal's detailed record of the case.

During last September's race weekend, a fire marshal inspected the campgrounds every morning. Using a field laptop computer and logging in to the application via a Web browser, the fire marshal looked at campgrounds that needed to be inspected. These campgrounds appeared as red colored polygons. When the fire marshal began his inspection of a campsite, he'd point and click his mouse and select the option to indicate he was now inspecting the site. The campsite polygon would turn yellow. When the fire marshal completed the inspection, he'd select another button that showed the campsite inspection completed, and the campsite polygon would change to green. When the fire marshal was finished with a campsite, he would call the command post and notify it of the results.

"This way, everyone could keep track of what's going on, whereas prior to using GIS technology, it was random," explains Nowak. "You might not be sure when was the last time somebody was in a campground or who it was that was supposed to inspect it next. Now it was almost like a game where you want all the campsite polygons to go from red to green."

Another real-world use involved what was termed "lines of concern," which were spatial buffers around electricity cables. The city wanted all recreational vehicles to be at least 25 feet away from power lines to prevent the possibility of a fire starting from a downed power line.

"We had all the power lines that ran through campsites digitally located and mapped using GPS equipment," says Nowak. "Somebody from the department of utilities would go out and inspect [the power lines]." Then, using a Trimble unit with that spatial layer visible, the inspector would "just turn the Trimble unit on, mark their location, and see if they were or were not within the buffer zone."

Capturing and managing information daily also gave event managers improved tactical capabilities. If more incidents occurred in a particular area or campground, personnel and resources could be redeployed as needed. Commanders and other users could also quickly find a city address or perform a parcel ID or property owner search if more information was needed about a specific incident or to access incident trends.

"The NASCAR events provide the City of Dover a twice-a-year real-world training ground to utilize new technology within National Incident Management System (NIMS)-compliant operations," explains Nowak. "After each NASCAR event, city staff has an opportunity to use this technology in some capacity in their everyday work. It also gives them ideas on how GIS technology can help them even further on the job. It's made a real difference in how we work."

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