Florence County Damage Assessment Relay Tool
DART

Florence County Damage Assessment Relay Tool (DART) was created to allow inspectors to go into the field after a catastrophe or natural disaster and collect location information and determine structural damages. The program calculates the dollar amount of damage based on assessed building values on the structure. The collected data is then transmitted back to a central location live for mapping and analysis. The inspector field units (computers) also store damage data for later synchronization in the event that the communication infrastructure is non-functional.

In the event of a disaster, it is imperative that information about the location and severity of damaged structures be relayed as quickly as possible to relief and support agencies. This allows Federal and State leaders to make the proper emergency declaration(s) and provide adequate and appropriate services to the citizens of Florence County. For example, if a family is displaced by a destroyed home, DART will provide the necessary information to assist the appropriate agencies with determining shelter needs.

Florence County successfully tested the new DART program on Tuesday, June 15, 2010. Due to the positive results, Florence County implemented the DART program immediately as an integral part of the disaster recovery process.

History

In the past, a building inspector and an appraiser went into the field with a paper map, a clip board, and paper to write down their findings. They had to determine by using the paper map which parcel they were looking at when they found a damaged structure. After locating the parcel, they recorded the address if they could determine it, the type of structure, and the amount of damage. These hand written notes describing the type, severity and location of the damage were returned to the office. Tax Assessor staff would then research each location of damage to determine the parcel number, using the County computer data system known as AS400. Tax Assessor staff would then determine the dollar value of the identified structure and manually calculate the percentage of damage. To complete the process, all information was entered into a Microsoft Excel spreadsheet that summarized the calculated value of damage. Maps using the parcel number provided were later created and both the spreadsheet and the maps were then forwarded to Federal and State leaders and support agencies. The process from field observation to final reporting typically took three (3) days minimum to complete using the manual system.

Benefit/Importance of Project

Immediately following a disaster the first questions asked are, "How bad is it?", and "Where is the major damage?" The answers to these two critical questions drive the decision making process about allocation and prioritization of emergency resources and

response. The DART project was undertaken to ensure that the answers to these questions in Florence County were obtained both accurately and quickly.

Based on the realized need for a faster reporting system, County Departments consisting of Emergency Management (EMD), Geographic Information Systems (GIS) and Building Inspections teamed up to develop an improved process known as the Damage Assessment Relay Tool (DART).

Following a natural disaster or emergency, the simple ability to identify a location can be challenging with road, address signs, and even normal landmarks missing. Field teams expressed a need for reliable software and a system to help identify their current location. Florence County EMD agreed there was a need for an improved system for damage information collection. The current system was slow and did not provide exact damage location.

Immediately after a storm or event is over, the reporting begins to the State and Federal authorities about the magnitude of damage by deploying assessment teams to the field to determine the impact on structures throughout Florence County.

Damage assessment reports, once complete, are submitted to State and Federal agencies that in turn provide aid to our community based on the extent of the damage. The faster the Federal Emergency Management Agency (FEMA) and other outside agencies receive these damage assessment reports, the faster citizens in Florence County can receive relief and support through grants or low interest loans. In the event of a disaster, it is imperative that information is relayed as quickly as possible to all agencies so that adequate and proper services can be provided to the citizens of Florence County.

These reports also provide information to State agencies such as the Department of Health and Environmental and Control (DHEC), the Department of Social Services (DSS), and other Federal agencies such as FEMA for response. Additionally, this information is used immediately on a local level to update community agencies, leaders and decision-makers allowing them to identify the need for relief efforts in the most critical areas and who requires the most help. DART can greatly speed up all recovery efforts because of faster reporting which minimizes the time it takes for the community to return to normal.

The entire population of Florence County will benefit from the availability of this resource. DART reduces the amount of time that it takes to gather and analyze data so that help can arrive on site to assist sooner. The realized improvement in response time from 3 days to a few hours, is an immediate value to all the citizens of Florence County. Those individuals that have experienced the most extensive damage to the places they live and work are the first to benefit from this effort. DART also benefits employers who rely on these people as workers, minimizing losses in economic productivity. DART's reporting will help minimize days businesses must be closed, thereby reducing potential loss of income. All socio-economic groups and communities throughout Florence County

and the surrounding communities benefit by having the commercial center of the region back in full operation as soon as possible.

Additional benefits to the citizens of Florence County are possible. Technology solutions could be developed from this project for use in other areas of mobile services for Florence County. Several departments already provide services to our community. It may be possible to develop mobile technology projects similar to DART to support public safety vehicles and public works, as well as appraiser, engineering, or building inspection departments and staff.

A test scenario for DART determined the dependability, functionality, and accuracy of the software in collecting locations and populating Assessor's Office data to the assigned location. During the test, building inspectors using the DART program were 100 percent successful in finding and documenting simulated damage. Support staff utilizing DART information were able to provide damage assessment reports to the Emergency Operations Center (EOC) and County leaders immediately. This demonstrated rapid response provides the confidence that the system works and that the County leadership can depend on DART.

 During an emergency, Florence County EOC activates. During activation, several stations are manned for around-the-clock reporting. At the EOC, those stations include transportation, communications, fire, mass care (American Red Cross, DSS, Salvation Army, DHEC), health and medical (DHEC, mental health, hospital, Emergency Medical Services), damage assessment (Assessor, Planning, Codes) and law enforcement teams. All agency representatives can be ready to take action based on the information reported. The primary tool used for data and information reporting within the EOC is a web-based crisis information management system known throughout the State of South Carolina as WebEOC.

It was necessary for GIS development staff to build a knowledge and understanding of WebEOC in order to create data integration between DART field data and existing WebEOC software. A damage assessment board was successfully created within WebEOC to display DART's real-time field results summarized by severity of damage, type of structure, and specific location.

As a final, yet valuable, element the process needed a visual display that may be viewed on any County computer. A web-based viewer was created to display the damage locations with pertinent information. Maps can be viewed and/or printed as needed.

Additional benefits of the DART program that were recognized included real-time reporting from the field by inspectors when citizens were in need of medical attention or roads were impassible. DART provided field inspector comments along with GPS coordinates of the location for an improved response. Within the EOC, the field reports were entered into WebEOC for medic or public works notification and proper responses.

Project Effort/Difficulty

Florence County GIS and EMD staff met in March, 2010 to outline goals and necessary elements for successful DART development. With the Palmetto Eagle Statewide emergency preparedness exercise planned for June, 2010, the pressure was on to move quickly.

GIS staff toured the State EMD facility and control point to familiarize themselves with the process, people and programs involved in the emergency preparedness and reporting process. Since the GIS staff had an immediate need to understand the details of WebEOC software, the tour helped identify key State staff to facilitate information sharing.

With no funding allocated for the project, Florence County GIS needed to make use of existing and limited resources. This challenge required creative and innovative problem solving and resourcefulness. After much collaborative effort, the DART program was developed.

The DART program was originally developed in an ESRI mobile application known as ArcPad. Since ArcPad required software licensing per computer and was more limited in capability, the decision was made to migrate to ESRI's new ArcMobile application. With DART's logic already in place, the program needed to be translated into a more sophisticated application for the field collection elements. As ESRI ArcMobile allows a more extensive software deployment and therefore a broader potential of use by Florence County services, it clearly was the best use of existing software. However, since the ESRI ArcMobile program was only introduced into Florence County GIS during this calendar year, a significant learning curve existed. The challenges of migrating a process and utilizing a new software application were overcome through technology discussions and sampling within the GIS department. As a result, the technology was utilized to maximum potential and DART moved forward for testing.

The Building Division staff were designated as field inspectors for the exercise; therefore, inspection staff were trained to operate the ArcGIS Mobile DART program on their mobile workstations. Inspection staff testing of DART began thirty days prior to the Palmetto Eagle Exercise on June 15, 2010. During the daily testing, the inspectors were able to identify issues with the hardware (laptop, internet access card, GPS (Global Positioning System) device) and with the software (DART). Issues noted were resolved and GIS staff continued to make improvements to the program to enhance ease of use, functionality and dependability.

The Palmetto Eagle exercise also reinforced the need for routine and repeat testing of the system to ensure all the connections continue to work and that the teams remain confident in the use of the DART program.

DART's logic involves the ability to allow GPS locations to display on a mobile device so that an inspector can create a point on a map. The inspectors require the accurate

display of roads, aerial images, and property lines (parcels) in order to make the correct visual determination. Next, DART must provide data about the location to the inspector in a format that is easy to use. The inspector can read the owner name, assessed value of the structure, and the site address. With this information, the inspector would select from a drop down menu in DART to show the amount of damage (by percent in increments of 10) along with a determination of the use of the structure (single family residential, commercial, governmental use). The drop-down menus were added to keep the field collection process as consistent as possible for the inspectors. After the inspector adds the percent of damage, DART will automatically calculate the dollar value of damage to the structure using a mathematical equation that takes the appraised value less the percentage noted as damaged.

In order to provide the necessary information to the damage assessment team, the GIS programmer had to connect digital parcel data to Tax Assessor data from the County's AS400 computer system. Appraised value of property, from Tax Assessor's records, could then be displayed for analysis. Data is updated daily in order to provide the most accurate information to the inspectors. FEMA disaster declaration form requirements were carefully measured when determining the field data necessary to report back to central operations.

After collection of a field point, the process continues as the data collected remotely is relayed back in real-time to a central location for dissemination. As previously stated, the EOC already utilizes a highly-dependable program for information distribution known as WebEOC. Therefore, the goal was established to marry the live field data results to WebEOC. Adding data to existing software "live" required team work. The County WebEOC administrator and GIS DART programmer required several tests and trials before realizing success. As a result, information about the amount and severity of the damage is now available for display on WebEOC boards based on field data summarization in a real-time report. This further summarization and data table update functionality of the program allows for future development without changing field components for hands-off mapping capabilities. Additionally, a web-based situational awareness tool was developed to support decision makers. The web application allows for mapping per individual incident or the entire County. The new Florence County Emergency Response and Planning website built on Adobe Flex Flash technology showed damage locations along with attribute information in real-time. As a result, EOC and EMD personnel could utilize a visual element that added traffic camera feeds, shelter locations, weather radar conditions and routing capabilities along with parcel number, owner name, percent damaged, and building value when analyzing the damage locations. Making the WebEOC connections in addition to the creation of a website for this purpose both presented challenges to staff. Traditional mapping capabilities within the Emergency Operation Center remain available for staff that would utilize damage assessment field data.

Because of the complex level of program knowledge for ESRI's ArcGIS Server, ArcGIS Mobile software, database management, WebEOC and web development using highly functional Adobe Flex Flash technology, the level of difficulty to accomplish our project

goal was significant. Our objective, however, was simple: collect data necessary for damage reporting in the field and send back to central command real-time for analysis and reporting.

Continued improvements are planned to further simplify the DART process from beginning to end. Additional enhancements and functionality to the Florence Emergency Response web-application are possible. However, simply bringing all the elements together for DART was a major undertaking. The level of detail involved in making all the programs and data communicate was highly complex and challenging.

Project Originality/Innovation

To our knowledge, DART is a first-of-its-kind for South Carolina. No other County in the State has developed a program which combines mobile mapping technologies with GIS and tax data to provide a data rich GPS location coordinate for damage assessment reporting to emergency agencies. This is specifically true of the WebEOC Board enhancements. With no similar models to base the DART program and functionality off of, the County needed to develop a program from scratch. After reviewing all the resources available, staff developed a seamless and robust program as a service to Florence County that is unlike any other noted throughout South Carolina and perhaps beyond.

DART takes existing, but separate software programs used by different County and State agencies, and allows them to communicate and share information. This makes the departments, which formerly operated as separate entities, a coordinated team.

DART utilizes an existing process for reporting damage assessment and improves it dramatically. It differs because it automates the process for increased productivity while realizing improved results because of the benefit of GPS and mapping support. The use of GPS and existing County GIS data greatly improves the accuracy of the information not only for damage reporting to the State and Federal agencies, but also by allowing local decision makers to provide critical help to those that need it the most.

In 2007, Florence County GIS formed as a single department centralizing software, hardware and personnel resources to better serve the needs of the County. Since Florence County already utilizes ArcGIS Server Advanced level licensing that includes ArcMobile application development and deployment, no additional funding for the program was necessary. By maximizing existing resources, communication bridges were crossed and barriers between departments were broken. True team efforts were realized between Emergency Management, GIS, and Building Inspection departments.

Additional ArcMobile and other ESRI ArcGIS Server projects are planned for other departments within Florence County government in the months and years to come. Under fiscal constraints, Florence County was able to develop an innovative solution to a problem using existing hardware, software and development staff resources at no additional cost to the taxpayers of Florence County.
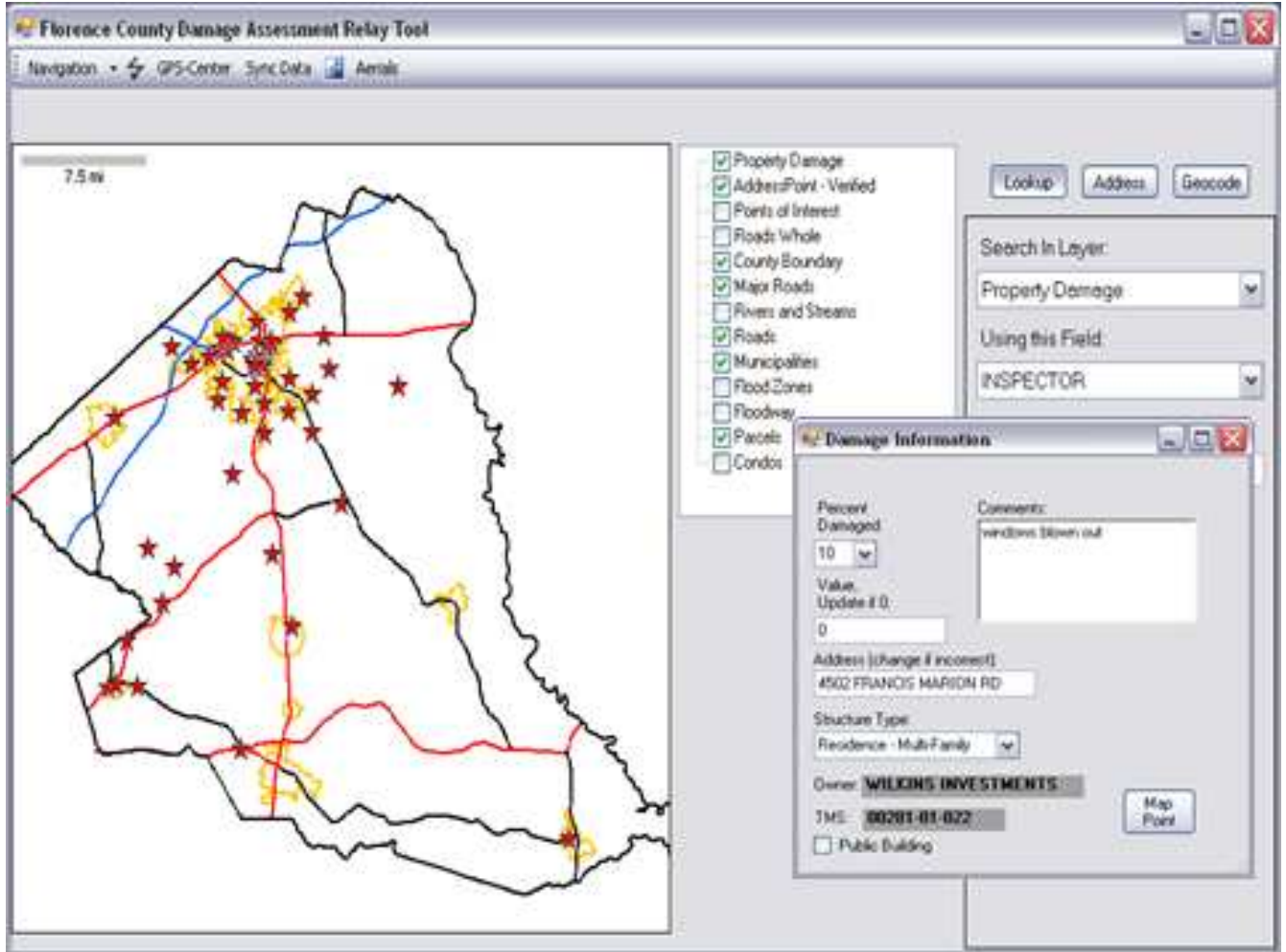
The process by design is a creative collection of solutions using the latest tools, software, and extensive technical knowledge to provide a smooth result to meet and exceed the expectations of our EOC. The process then marries the local GIS database to the solution to provide very accurate geo-spatial locations for damage reporting.

Following the successful test of DART during the statewide hurricane exercise on June 15, 2010, front-page headlines for the *Florence Morning News* proclaimed "DART Passes Test".   Since that time, a number of counties have contacted Florence County seeking information about DART. South Carolina Emergency Management Department has asked the Florence County EMD and GIS departments to host a regional training session on DART.   Florence County GIS is pleased to discuss program successes and technical development with other agencies and local or State government entities.

All intellectual property rights for DART and the Florence County Response and Reporting Website belong to Florence County GIS Program and Web Development staff. Additional recognition goes to Florence County EMD Staff, Florence County Building Inspection Staff, and Florence County Tax Assessor's Office Staff in their support in the development of this project. It takes a team of dedicated and highly-skilled employees to realize this level of program development success with limited time and resources. The true benefit of this program will be demonstrated when the test scenarios become live events at which time the true public benefit will be realized.
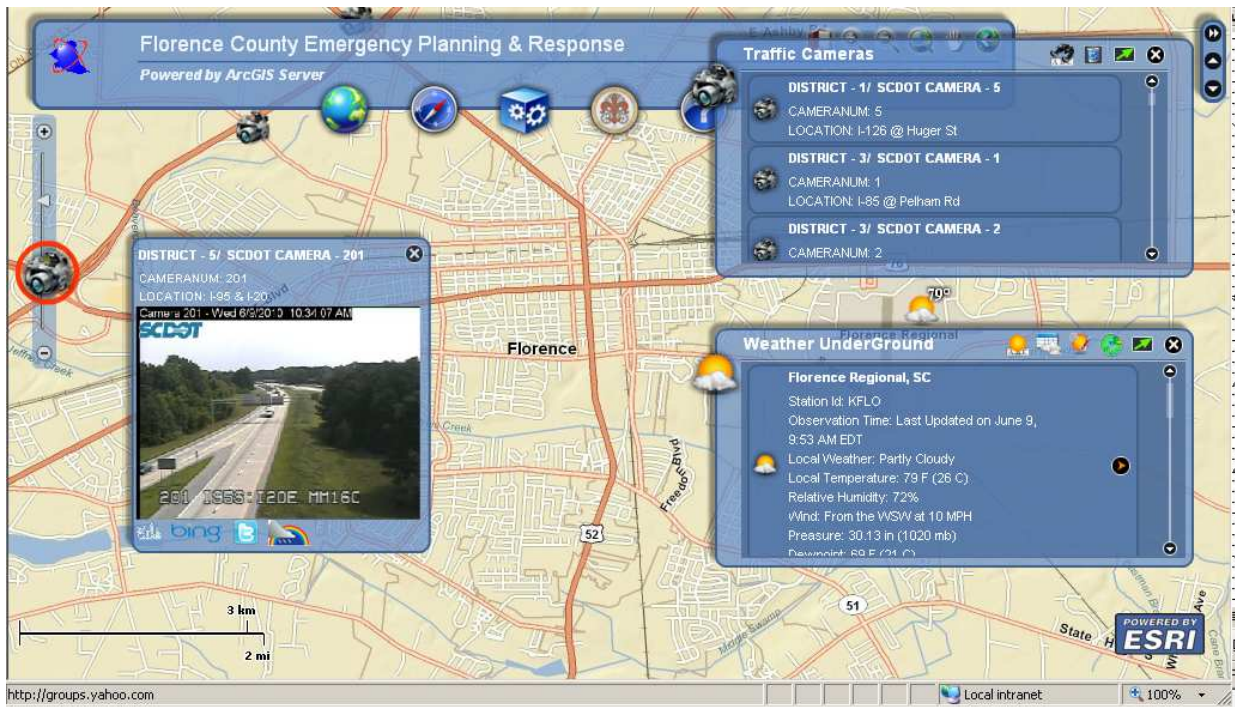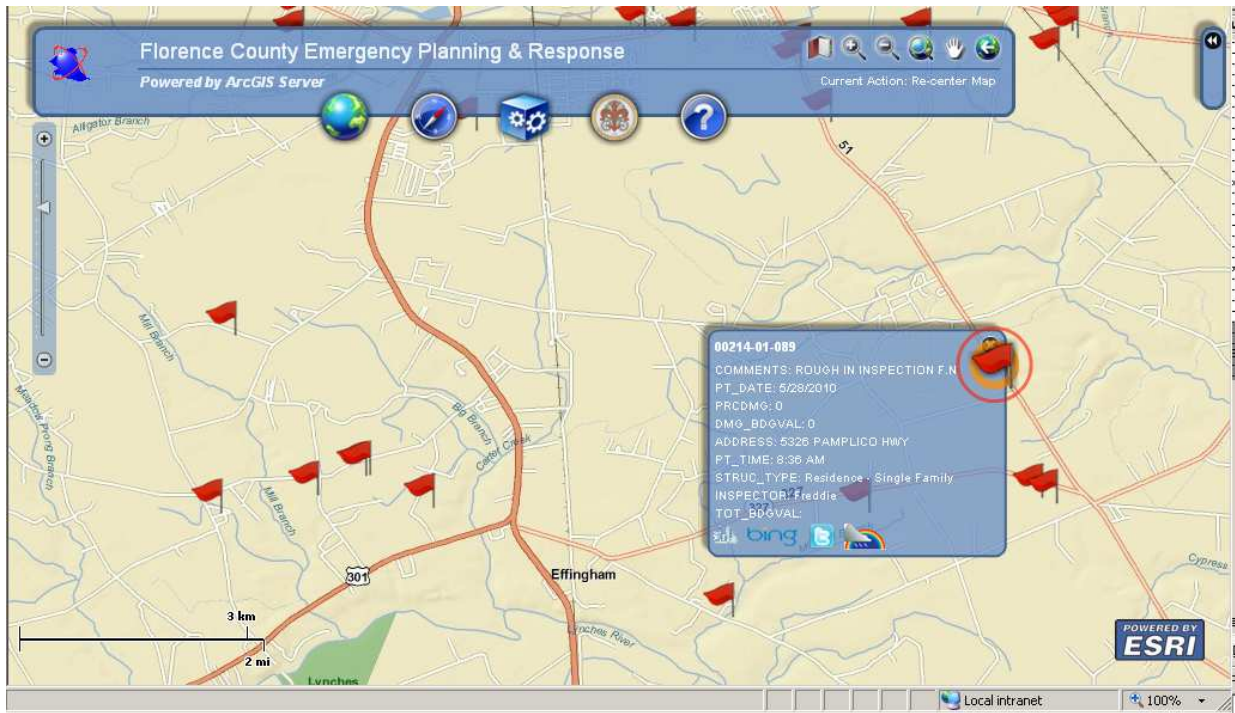
Supporting Materials:

Florence County Damage Assessment Relay Tool (DART) – ESRI ArcGIS Mobile Data Entry Screens:

Web EOC Damage Assessment Board (live 6/15/2010):

Structure Type	Minor Damage		Major Damage		Destroyed	
	Number	Amount	Number	Amount	Number	Amount
Homes	34	946179	63	25530767	3	57726
Mobile Homes	28	159086	20	3089495	2	555228
Businesses	12	5202256	23	20663897	10	108130871
Government Facilities	0	0	0	0	0	0
TOTALS	74	6307521	106	49284159	15	108743825

Florence County Emergency Planning & Response Adobe Flex Flash application:

Information automatically generated by DART to display along with field collection:

TMS	PrcDmg	Inspector	Pt_Date	Pt_Time	Comments	Dmg_bdgval	Struc_Type	Address	Govt
90027-08-003	10	TestLaptop	6/9/2010	3:31 PM		34414	Residence - Single Family	605 FAIRWAY DR	☐
00027-08-002	50	TestLaptop	6/9/2010	2:31 PM		11732	Residence - Single Family	607 FAIRWAY DR	☐
90027-03-004	10	TestLaptop	6/9/2010	2:28 PM		6640	Mobile Home	612 FAIRWAY DR	☐
90027-01-003	50	TestLaptop	6/9/2010	12:14 PM		12833	Mobile Home	1909 HIGHLAND AV	☐

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EDITORIAL: Pee Dee residents should to do their part for hurricane preparations

Morning News

Published: June 16, 2010

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It's long past Hurricane Preparedness Week, which was observed May 23-29, but it's still not too late to get ready in case a hurricane strikes.

Hurricane season began June 1 and ends Nov. 30. With any luck, none will make their way to the Pee Dee this year and the season will be as quiet as it's been in recent history. Local and state officials are doing their part to be ready if that streak changes.

On Monday, S.C. Highway Patrol troopers and staff from other state agencies conducted a large-scale lane reversal hurricane preparedness exercise in Marion and Horry counties. They positioned themselves at sites along several routes to carry out the duties they would have in the event of an emergency. They also practiced how disabled vehicles in the roadway and traffic crashes will be handled during a lane reversal.

In case of a massive hurricane evacuation ordered by the governor, lanes along 23 miles of road would be reversed from Marion County to just outside Aynor. Normal lanes of travel would resume near the S.C. 501 and the S.C. 501 bypass in Marion.

On Tuesday, Florence County Emergency Management officials successfully tested a new Damage Assessment Relay Tool, or DART, for the first time. DART gives inspectors the ability to assess damage at the site of a catastrophic event and provide damage estimates, additional information and location data in real time to a remote command center.

DART's capabilities are expected to help disaster response teams adjust plans and track the path of disasters such as hurricanes and tornados. Not only that, DART can speed up the process for obtaining federal aid for disasters. Florence County is the only county in South Carolina using this program.

Even when our area doesn't sustain a direct hit from a hurricane, it often gets a dose of some of the hazards associated with hurricanes and tropical storms such as high winds, tornadoes and flooding.

The National Oceanic and Atmospheric Administration, like most public safety agencies, encourage people to develop and follow a disaster plan in case of emergency. It offers these tips for creating such a plan:

—Discuss the type of hazards that could affect your family. Know your home's vulnerability to storm surge, flooding and wind.
—Locate a safe room or the safest areas in your home for each hurricane hazard. In certain circumstances the safest areas may not be your home but within your community.
—Determine escape routes from your home and places to meet. These should be measured in tens of miles rather than hundreds of miles.
—Have an out-of-state friend as a family contact so all your family members have a single point of contact.
—Make a plan now for what to do with your pets if you need to evacuate.
—Post emergency telephone numbers by your phones and make sure your children know how and when to call 911.
—Check your insurance coverage. Flood damage isn't usually covered by homeowners insurance.
—Stock non-perishable emergency supplies and a Disaster Supply Kit.
—Use a NOAA weather radio. Remember to replace its battery every six months, as you do with your smoke detectors.
—Take first aid, CPR and disaster preparedness classes.

According to NOAA, preventing the loss of life and minimizing the damage to property from hurricanes are responsibilities shared by all. Please be prepared and try to stay safe.

— Unsigned editorials represent the views of this newspaper: Editorial Board members are Mark Laskowski (regional publisher), Sam Bundy (sports editor), Kimberly Ginfrida (content manager), David Johnson (regional circulation director), John Sweeney (The Weekly Observer editor), Charles Tomlinson (Lake City News & Post editor) and Jackie Torok (metro editor).

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CARLTON PURVIS/MORNING NEWS

James McCall III, an IT technician with the county GIS Office, works to populate data on a map of Florence County at the Emergency Operations Center in the Florence County Law Enforcement Complex during a hurricane simulation Tuesday.

By Carlton Purvis

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EFFINGHAM — The Florence County Emergency Management office ran a successful first test of a new damage assessment tool at the Florence County Law Enforcement Complex on Tuesday.

The Florence County Damage Assessment Relay Tool (DART) gives inspectors the ability to assess damage at the site of a catastrophic event and provide damage estimates, additional information and location data in real time to a remote command center. Florence County Emergency Management tested DART as part of a statewide emergency preparedness exercise.

DART is a computer program developed by Florence County Geographic Information System (GIS) staff that combines GIS data with tax assessor information and calculates the dollar amount of damage based on property value of buildings and structures. Florence County is the only county in South Carolina using this program.

A hallmark of the program is the time it could cut in obtaining federal aid for disasters.

"Almost instantly we're aware of how much damage has been done and the dollar amount," Florence County Emergency Management Director Dusty Owens said. "That information is critical to submit to the state and the federal government because that is one of the considerations to whether or not a presidential disaster declaration is issued."

In past disasters, both an inspector and an appraiser would travel to a site with a paper map, clipboard, pen and paper. On the map, they had to figure out what piece of property they were looking at when they came to a damaged area. Then they would write the parcel number, the type of structure, amount of damage and the address — if they could determine it.

For the simulation, two inspectors, Brice Isgett and Jeff Thomas, spent Tuesday assigned to locations in south Florence that had been "damaged" by a hurricane similar to Hurricane Hugo. The Kangaroo gas station's awning had blown into the gas station. A cell phone tower fell onto a building nearby and a tree took out 16 windows at the Clemson Extension office.

They marked each site with a red star and additional comments. With a click, their damage estimates were sent.

"About five years ago, a tornado hit and we had to fill out an individual piece of paper for each property," Isgett said of Florence County Emergency Management pointing to a sheet of paper in the cab of the truck. The papers were taken to the tax assessor's office and took three days to process the estimated damage for the neighborhood.

Now, they use dash-mounted laptops to plot points and send them back to the emergency operations center wirelessly. DART provides drop-down boxes for each field and uses GPS to pinpoint a team's exact location with a view of the site from the air. "This way if the house is gone or completely

destroyed, we can still see what was there," Isgett said.

In the event communication is down, the data can be logged into the computers and uploaded later at the emergency operations center.

What would have normally taken days to complete took roughly a morning. Owens said the speed of the process during the simulation came from the ability to go directly to the damage, which isn't always possible in an actual disaster situation.

"In a real event, it will take a little bit longer because we'll be covering a much broader area and finding the damage on the ground, but it absolutely makes the process faster and much more accurate," he said.

DART's capabilities should also help disaster response teams adjust plans as new information becomes available and allow agencies at the emergency operations center to track the path of disasters such as hurricanes and tornados.

"With these coordinates plotted on maps, we can view wind patterns and where that damage occurred," Owens said. This information helps make decisions on opening additional shelters and where to send additional resources, he said.

Other parts of the simulation included opening a hurricane shelter and simulated donations and volunteers.

The scenario for the statewide simulation centers around a hurricane similar to Hurricane Hugo that hits the coast. A make-believe terror group takes advantage of the chaos and attempts to hit targets of opportunity in upstate South Carolina. Several counties, State Law Enforcement Division, S.C. Department of Health and Environmental Control, Federal Emergency Management Agency and the FBI are participating in the simulation.

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