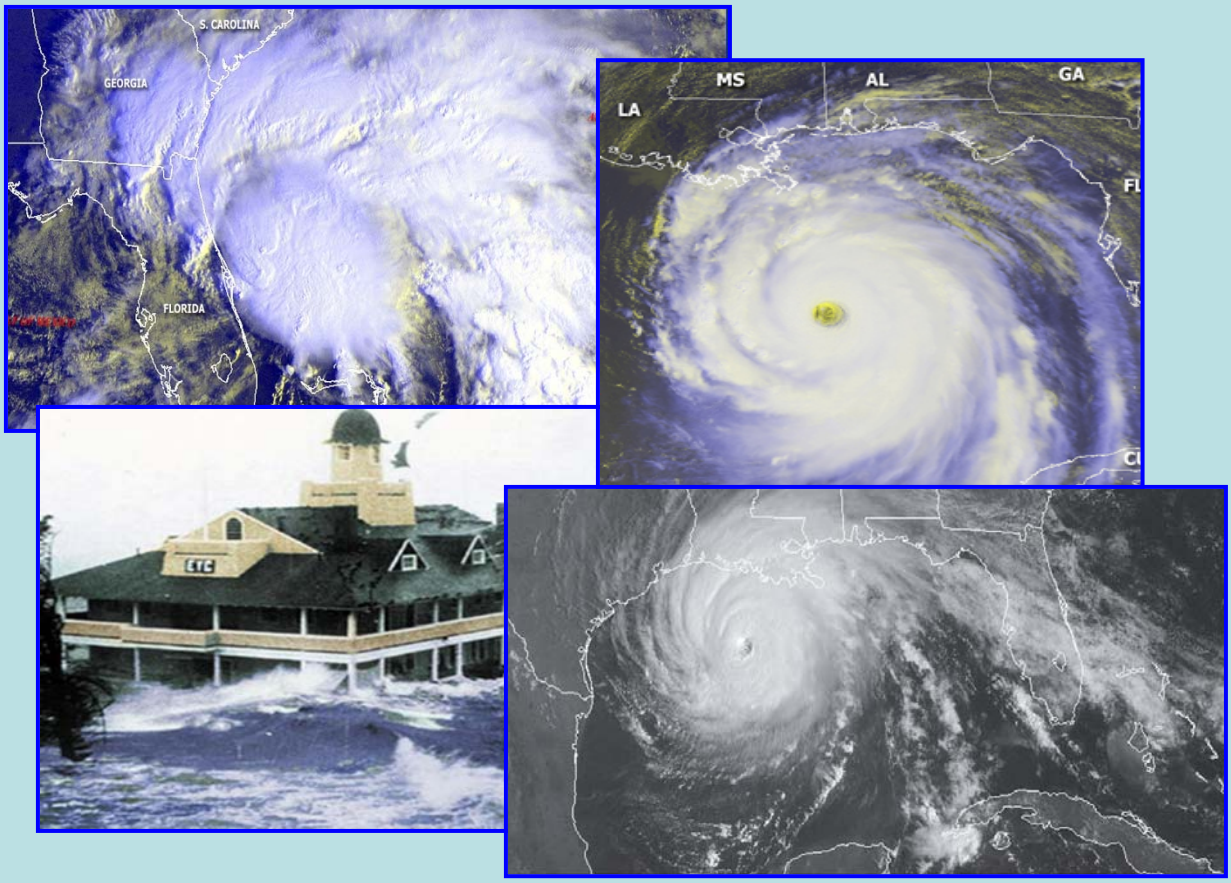
Exploratory Review: Information Dissemination Flow of Tropical Cyclone Information



Office of the Federal Coordinator for Meteorological Services and Supporting Research

November 2007

EXPLORATORY REVIEW:

INFORMATION DISSEMINATION FLOW OF TROPICAL CYCLONE INFORMATION

Office of the Federal Coordinator for
Meteorological Services and Supporting Research

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Washington, DC
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Foreword

Every year the swirling winds of the South Atlantic, or in the Caribbean, combine with the heat of the ocean to create the most powerful engines on Earth—tropical cyclones. Millions of dollars are spent in tracking, forecasting, and preparing for the destruction they cause if they make landfall. Watches and warnings are issued; meteorologists from the Tropical Prediction Center/National Hurricane Centerforecast their track and intensity with ever increasing accuracy. And yet people die.

The forecasting of tropical cyclones and the vast preparations made well in advance of the storms—through disaster planning, preparation, and exercises all have the same goal—to save lives, reduce injuries and protect the property of U.S. citizens. In an age of constant and instant communication, it is imperative that all citizens receive, understand, and act to the severe threats posed by theses destructive storms.

But still "I didn't know" is a statement heard from some survivors of landfalling hurricanes. Some did not know evacuation orders were given, or know how powerful the storm would be, or did not comprehend the tremendous impact it would have on them. A vital step to ensuring all citizens "do know" involves understanding what prevents every citizen from receiving crucial information regarding impending tropical cyclones. This report is a summary of an exploratory review that examines how tropical cyclone ***information flows***, with a focus on the information flow from emergency managers to citizens of communities.

The exploratory review was performed in two locations prone to tropical cyclones—Mobile County, Alabama, and Charleston County, South Carolina. The report summarizes the methodology, major observations and follow-on considerations. This exploratory review is meant to serve as a starting point, with further formal investigations needed in this very important area of the Nation's forecast and warning program. The expectation is that this review will aid in removing "I didn't know" from the vocabulary of those affected by tropical cyclones.

I want to thank Mayor Samuel L. Jones of the City of Mobile, Alabama, and Mayor Joseph P. Riley, Jr. of Charleston, South Carolina, for their support of this exploratory review. I especially want to thank the emergency management leadership of Mobile and Charleston Counties—Mr. Walt Dickerson and Ms. Cathy Haynes, respectively—for their outstanding emergency management program and exceptional support of this review.

Samuel P. Williamson
Federal Coordinator for Meteorological Services
and Supporting Research

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1 Introduction

1.1 Overview of Exploratory Review

Tropical cyclone is a term that encompasses tropical depressions, tropical storms, hurricanes, and typhoons.[1] Significant portions of world's population are vulnerable to landfalling tropical cyclones. In the United States, approximately fifty percent of Americans now live within 50 miles of a coastline, with significant portions of this population directly vulnerable to tropical cyclones.[2] In 2003, an estimated 153 million Americans lived in coastal counties.[3]

It is inevitable that a tropical cyclone will make landfall again in the United States. Meteorologists and emergency management officials at all levels of government and from the private sector conduct research, perform and coordinate planning actions, and hone operational procedures to provide excellent service to the general population that could be affected by tropical cyclones. At every level, whether private or public, the goal is the same: to save lives, reduce injuries, and protect property.

One aspect that is exceptionally important to accomplishing the above goal is to ensure that ***everybody*** in a community is notified of tropical cyclone information and that they receive appropriate information to make vital decisions in a timely manner. A survey of evacuees of Hurricane Katrina illustrated that improvements are needed in the area of information dissemination.[4] The survey indicated that vital information was not received by a significant portion of those interviewed. Of 680 adults surveyed, 25 percent said they never heard an order to evacuate before Katrina struck. When asked if they knew if the *government* issued an evacuation order for their area, 62 percent responded negatively. Of those who did hear the order, 32 percent responded that the message did not give clear information about how to evacuate. The second most cited reason for not leaving New Orleans (28 percent) was that they did not think the storm or its aftermath would be so bad. In this example it appears important hurricane information either was not received or not understood, highlighting the need for further improvement in the current warning dissemination system

Social science research has an important role in helping improve the warning process. As stated in the 2007 Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM)-sponsored *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead*:[5]

> "A growing need exists to connect improved tropical cyclone forecasts and warnings to response actions, thereby ensuring the most appropriate responses by decision makers, by those who implement the decisions, and by the entire at-risk population. One such research area is how different end users of tropical cyclone forecasts and warnings receive, interpret, and act on that information."

1.2 Efforts to Improve the Public Alert and Warning System

Although not the focus of the exploratory review, it is important to mention that a great deal of effort is ongoing within the public and private sectors to improve the public alert and warning system. Three pertinent references—of which there are certainly many more—that describe the current public alert and warning system and its deficiencies, recommendations for improvements and recent legislation are:

- The Partnership for Public Warning (PPW)—a partnership between the private sector, academia, and government entities at the local, state and Federal level—issued a report in 2003 entitled, *A National Strategy for Integrated Public Warning Policy and Capability*[6]
- The Congressional Research Service issued an updated report for Congress in September 2006 entitled, *Emergency Communications: The Emergency Alert System (EAS) and All-Hazard Warnings*[7]
- United States Government Accountability Office (GAO) issued a report to Congressional Committees in March 2007 entitled, *Current Emergency Alert System Has Limitations, and Development of a New Integrated System Will Be Challenging*[8]

As stated in an Executive Order issued on June 26, 2006, the U.S. policy is "to have an effective, reliable, integrated, flexible, and comprehensive system to alert and warn the American people…"[9] The order also outlined several functional requirements for the Secretary of Homeland Security to meet. The requirements included:

- Reviewing existing resources;
- Developing common protocols, standards and other procedures to enhance interoperability;
- Disseminating alerts and warnings on criteria such as location or risk;
- Accounting for language and disability needs;
- Identifying and supporting required communications facilities
- Conducting training, test, and exercises;
- Performing public education regarding emergency alerts and warnings;
- Coordinating and cooperating with all levels of the government and private sector;
- Managing and executing the Emergency Alert System as part of the broader system;
- Ensuring that the President can alert and warn the American people.

The Office of National Security Coordination (ONSC) within the Federal Emergency Management Agency (FEMA), a component of the Department of Homeland Security (DHS), is leading the federal efforts to improve the public alert and warning system. The ONSC serves as the Executive Agent for the national–level Emergency Alert System (EAS). The ONSC also functions as the Department's Program Manager for the Integrated Public Alert and Warning System (IPAWS) initiative of which EAS is a component.[10] In addition to DHS/FEMA, other partners involved in efforts to improve the public alert and warning system include: Federal

Communications Commission (FCC), Department of Justice, Department of Interior U.S. Geological Survey, DHS/Information Analysis and Infrastructure Protection (IAIP), PPW, Association of Public Television Stations (APTS), the National Oceanic and Atmospheric Administration (NOAA), and many other public and private organizations.

Under the IPAWS umbrella, there are several pilot projects to help develop an integrated public alert and warning system. Some of the pilot projects are:[11]

- Digital Emergency Alert System (DEAS). The DEAS involves the use of digital capabilities from public radio and television stations and other networks—along with the voluntary participation of public and commercial radio and television broadcasters; satellite radio, cable, and Internet providers; cell phone service providers; and equipment manufacturers—to provide alert and warning information to disaster support personnel and the public. The national DEAS pilot, which began in January 2007, will run for 1 year. By December 2007, all public broadcasting stations (over 300 nationwide) are to be DEAS-enabled.
- Geo-Targeted Alerting System (GTAS). The GTAS demonstrates and tests the ability to provide targeted warning down to individual households and businesses via cell phones, landline phones, pagers, desktop computers, sirens, and other geo-aware devices. This pilot is planned to end in 2007 with an end product being a national GTAS deployment plan.
- DHS Web Alert and Relay Network. This pilot program enables officials at each level of government (federal, state, and local) to send and receive messages using Web technologies. This pilot project started in 2005 and should expand Nation-wide by 2011.
- NOAA Weather Radio All Hazards (NWR). This project provides for upgrades to the NWR network and the purchasing of NWR receivers for public schools. To date, there have been 97,000 NWR's placed into public schools—this covers every public school in America. There will be an additional 42,000 placed into other schools.[12]

Figure 1-1 shows FEMA's vision of an integrated alert and warning system—a system described as "one message over more channels to more people at all times and places."[13]The IPAWS is integral to the vision: "The IPAWS framework is based upon the premise of providing alert and warning messaging in a coordinated manner, over as many platforms as possible, to ensure the widest dissemination and public receive capabilities."[14] As illustrated in the Figure 1-1, the future warning system will allow the public to receive the same message via a variety of mechanisms, including cell phones, radio, pagers, personal digital assistants (PDAs), computers, road signs, NOAA Weather Radio (NWR), Internet, television, and landline phones.

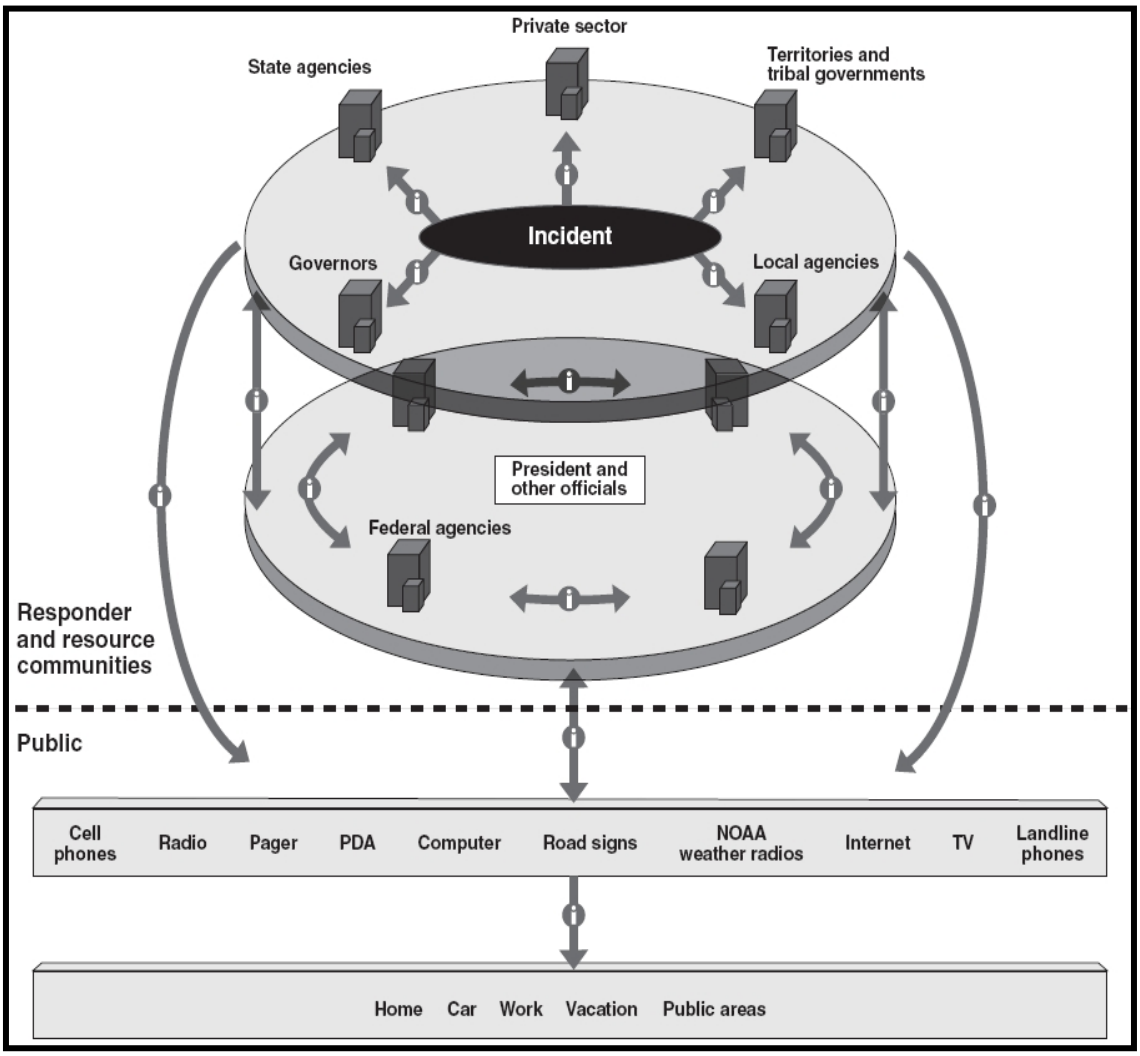

Figure 1-1. Vision of an integrated alert and warning system. (Credit: FEMA and GAO)

1.3 Impetus for the Exploratory Review

Every year the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) sponsors the Interdepartmental Hurricane Conference (IHC) to provide a forum for the responsible Federal agencies, together with representatives of the user communities such as emergency management, to review the Nation's hurricane forecast and warning program and make recommendations on how to improve the program. Evaluating lessons learned from the 2005 hurricane season was an objective at the 60th IHC held in March of 2006. Several action items emerged from the IHC regarding the review and improvement of the tropical cyclone warning system. This exploratory review of information dissemination is an outcome of the following IHC action:

- The Office of the Federal Coordinator of Meteorology (OFCM) will coordinate bringing together the appropriate federal agencies to begin the process of reviewing and improving the National hurricane warning "system

- Review all elements of the full end-to-end "system (e.g., protocols, responsibilities, non-governmental organizations [NGOs], communications, etc)

To meet this action, the OFCM conducted an exploratory review of one portion of the warning system—information dissemination. The exploratory review took place in two areas prone to tropical cyclones—Mobile County, Alabama, and Charleston County, South Carolina. This document summarizes the review and provides follow-on considerations to further the process.

1.4 Focus, Emphasis and Objectives of the Exploratory Review

The warning communications process has changed dramatically over the last couple of decades. Years ago, due to less communications capabilities, the communication tended to be linear. Today, with the development of new technologies and new intermediaries, the warning communication process is much more complex. Tropical cyclone information, including messages tailored for the individual needs of end users, can now be sent by public officials, the broadcast media, and private entrepreneurs. Additionally, tropical cyclone information can be received from multiple sources through multiple channels, including television, radio (including National Weather Radio All Hazards (NWR) and satellite radio), the Internet, cell phones, personal data assistants, and vehicle navigation systems. Many of these new technologies, however, increase the possibilities of a "digital divide" between those who can afford them and those who cannot. The question remains: Is everybody in a threatened community receiving the information and understanding it sufficiently to make wise choices to protect themselves and their property from tropical cyclones?

As stated in the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead*, two research questions that need additional attention are:[15] (1) How does *information flow* from forecasters to various types of decision makers; and (2) What are the processes by which various user groups *receive,* interpret, and use forecasts and warnings? The focus of this exploratory review was the information flow and receipt of tropical cyclone information. ***An emphasis of this exploratory review was the tropical cyclone information flow from the emergency management community to various community organizations/entities and to local residents.*** The objectives of the exploratory review were to: (1) understand and document the information flow; (2) summarize information flow requirements and gaps; and (3) provide follow-on considerations to improve the flow that would ultimately serve to better protect coastal residents and property.

1.5 Diversity--A Challenge for Information Dissemination

In addition to technical challenges, the increasing diversity of the U.S. population has made the process of communicating vital tropical cyclone information, including watches, warnings and evacuation orders, more complex. Relevant areas of diversity include language, literacy, age, race/ethnicity (culture), social class, disabilities (such as hearing or sight), and availability of private transportation.

The diversity of the population of each county is important to note as an indication of the extent to which each setting includes groups who may have special issues or needs related to the receipt

and interpretation of warning messages, as well as responding appropriately. Table 1-1 depicts some population data from the 2000 U.S. Census for each county and compares it to national averages. It is interesting to note that Mobile and Charleston both had higher percentages of poor people (18.5% and 16.4%, respectively) compared to the national average (12.4%). Similarly, they had higher percentages of Blacks or African Americans (33.4% and 34.5%), compared to the national average (12.3%), as well as more persons with disabilities (23.8% and 21.1% compared to the country as a whole (19.3%). Mobile County had more individuals with less than a high school education (23.3%) than the national average (19.6). Charleston County had a somewhat larger proportion of households without private vehicles than the national average (11.9% compared to 10.3%). In summary in both regions there are thousands of residents who have special needs or who could be categorized as groups requiring special attention when it comes to tropical cyclone response.

Table 1-1. Population Data for Mobile County, Alabama, and Charleston County, South Carolina

POPULATION DIVERSITY MOBILE COUNTY, AL AND CHARLESTON COUNTY, SC 2000 U.S. Census*					
	Mobile		**Charleston**		**U.S.**
	#	%	#	%	%
Total Population	399,843		309,969		
Elderly, Over 65 Years Of Age	47,919	12.0	36,858	11.9	12.4
Elderly, Over 85 Years Of Age	5,316	1.3	3,855	1.2	1.5
Below Poverty Level	72,549	18.5	49,330	16.4	12.4
Foreign Born	9,133	2.3	11.124	3.6	11.1
Language Other Than English In Home	16,989	4.6	18,573	6.4	17.9
Black Or African American	133,465	33.4	106,918	34.5	12.3
Persons W/ Disabilities (5+ Age)	86, 863	23.8	59,609	21.1	19.3
Non-High School Graduate (25+ Age)	93,163	23.3	57,344	18.5	19.6
Households W/ No Vehicle*	13,410	8.9	14,648	11.9	10.3

* Statistics refer to individuals unless stated otherwise.

The technology exists for tropical cyclone information to be received in multiple ways, but, this does not guarantee that everybody will receive it. “Although new technologies make it possible to communicate forecasts and warning messages in new modalities it is important to acknowledge the existence of a “digital divide” where less-affluent citizens are likely to have limited access. Information sources can be limited for those with hearing or sight disabilities, and language can pose a problem for foreign-born or less educated citizens.”[16]

1.6 Overview of Mobile and Charleston Counties

Mobile County, Alabama, located in the southwestern corner of Alabama, encompasses 1,238 square miles.[17] Some of the towns and communities in the county are Citronelle, Saraland, Chickasaw, Prichard, Mobile, Theodore and Bayou La Batre (Figure 1-2). Charleston County, South Carolina, which includes a stretch along the Atlantic Ocean of nearly 100 miles long, encompasses 917 square miles.[18] There are 15 municipalities with Charleston County, including the City of Charleston, North Charleston, Mount Pleasant, Isle of Palms, Sullivan's Island, Kiawah Island, Seabrook Island, Ravenel, Hollywood, Meggett, Folly Beach, James Island, McClellanville and Awendaw (Figure 1-3).

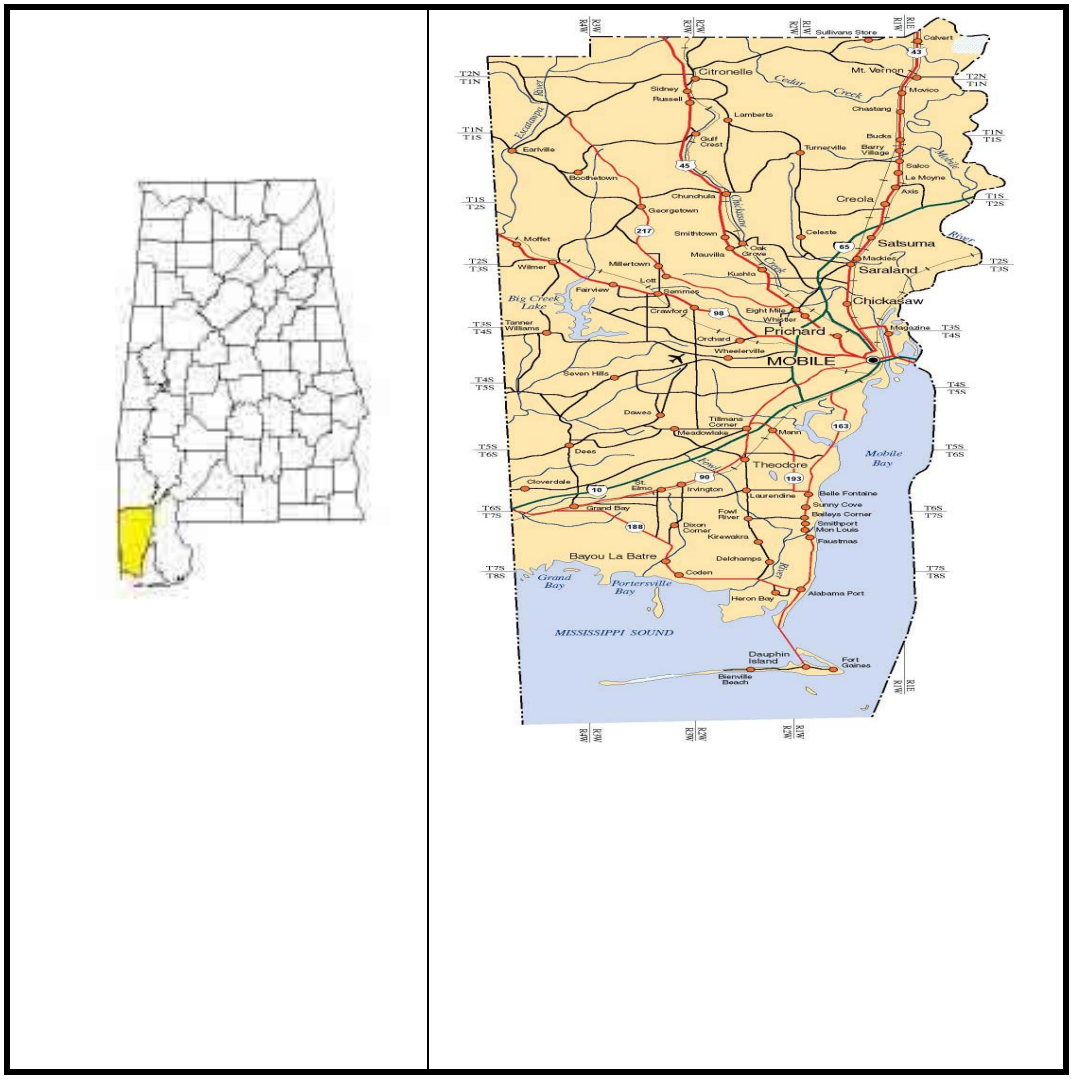

Figure 1-2. Mobile County, Alabama. (Credit: Dept. of Geography, Univ. of Alabama)

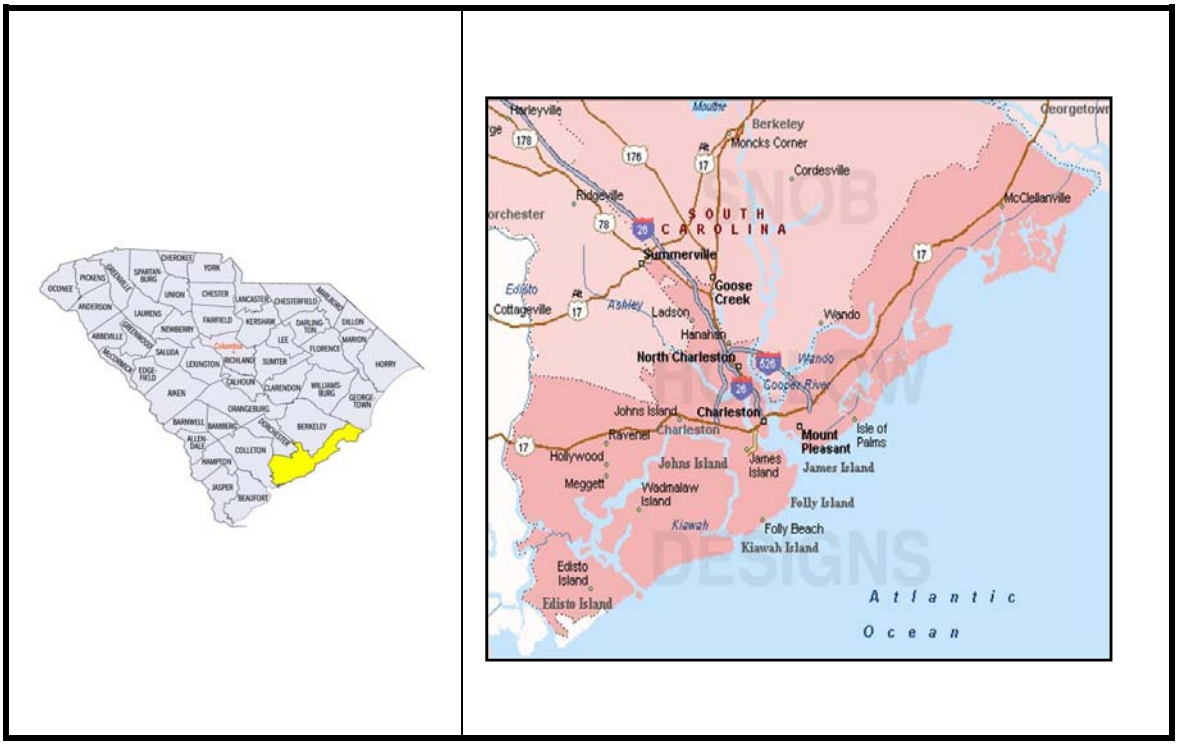

Figure 1-3. Charleston County, South Carolina. (Credit: Wikipedia)

1.7 Emergency Management Operations in Mobile and Charleston Counties

The emphasis for this review was the tropical cyclone information flow from the emergency management community to the various organizations and citizens of each community. This section provides background on the emergency management organizations for the two case studies – Charleston and Mobile Counties.

One of the many responsibilities for emergency managers is the operation of the Emergency Operations Center (EOC) that is activated during emergencies or disasters. EOCs are pre-designated command and control facilities established by an agency/jurisdiction to coodinate the activities necessary to serve the community's needs during a crisis. EOC facilities vary considerably with the size of the community and the extent to which emergency management activities are supported. Larger jurisdictions usually have a permanent emergency manager and staff, but in smaller communities other employees, such as firefighters and police, and/or volunteers are likely to perform the necessary functions when needed. Most EOCs will have stations where representatives from relevant agencies, including NGOs will be seated during an activation. The following highlights the importance of the EOC:

> "This is the central point of coordination for all major emergency operations…. The purpose of this central point is to ensure decision makers have direct unfiltered communications with one

> another and all outside response personnel. The EOC provides for coordination of the emergency response and recovery process by elected officials and other decision makers, who work together for improved efficiency and effectiveness."[19]

Both Mobile and Charleston have permanent emergency management directors, staff and facilities. Additionally, several of the larger municipalities, such as the City of Charleston, have employees with emergency management duties. In addition to operating and maintaining EOCs, these emergency management departments perform other important functions such as developing emergency plans for various contingencies in coordination with local governments, businesses, and organizations. They provide leadership in educating the public on emergency preparedness and response through outreach activities and public service announcements. Additionally, they orchestrate various drills and exercises to test planning and response processes.

1.7.1 Mobile County Emergency Management Agency

The Mobile County Emergency Management Agency (MCEMA) was originally established in 1952 as the Mobile County Civil Defense. In response to Federal, State, and local guidelines, the Mobile County Commission passed a resolution on June 8, 1987 establishing the MCEMA as the Office of Government to act for the Mobile County Emergency Planning District. The MCEMA has the primary responsibility for developing plans to protect citizens and property in all emergencies.

As designated by the Mobile County Commission, the MCEMA Authority Board is charged with the overall responsibility for personnel and budget. Participating cities and municipalities in Mobile County and the Mobile County Commission each appoint a representative to serve on the MCEMA Authority Board. This board is chaired by the current MCEMA Director, Mr. Walt Dickerson. In his role as director, Mr Dickeroson sets priorities and develops the emergency management plans for the county. Emergency prepareness exercises are held with all participating entities in the city and county.

Quarterly, Mr. Dickerson meets with the Executive Committee of the Authority Board. This committee is chartered and empowered to transact the normal business activities of the MCEMA. The committee is composed of three members—one from Mobile County, one from the City of Mobile which is the Mayor or the Mayors representative, and one member elected by the MCEMA Authority Board to represent the other jurisdictions within the County.

During tropical cyclone events the EOC is activated and manned with essential personnel to help protect the lives and property of the citizens of Mobile County. There were activations for Hurricanes Erin (1995); Opal (1995); Danny (1996); George (1997); Hannah, Isidore, Lili (2002); Ivan (2004); and Dennis and Katrina (2005). During these events, there were upwards of 110 people in the EOC for more than two-days. In addition, there were more than 550 people in the field and at other operations centers providing support for the entire Mobile County area.

1.7.2 Charleston County Emergency Preparedness Division

In December 2003, the Charleston Emergency Management Department was created to centralize coordination of emergency preparedness and homeland security responsibilities, as well as fire and rescue response. This department consists of three key divisions: Emergency Preparedness Division (EPD), Hazardous Materials Division, and Awendaw Fire Department. The department also maintains the county's liaison with the Charleston County Volunteer Fire and Rescue Squad. Mr. Jason Patno is the Emergency Management Director for Charleston County.

Ms. Cathy Haynes is the Director of Charleston County's EPD (CCEPD). The CCEPD provides leadership and assistance to reduce the loss of life and property in Charleston County from a variety of man-made and natural hazards and is responsible for the emergency operations associated with tropical cyclones..

Ms. Haynes is supported in her efforts by Mr. Thomas F. O'Brien Jr., the Deputy Director of Technical Services, Engineering Division of the City of Charleston. Mr. O'Brien is an engineer in charge of emergency planning for the city under the Public Services Administration. Mr. O'Brien supports and advises the Mayor, Mr. Joseph P. Riley, on all emergency related matters.

Since its creation, the CCEPD has responded to more than 70 large incidents, including Hurricane Hugo (1989); repatriation of American hostages from Baghdad, Operation Desert Shield (1990); a train accident with overturned chemical tank cars (1992); a plane crash, (1995); an earthquake, 3.7 Richter scale, with considerable damage to schools in Dorchester County (1995); Hurricane Fran (1996) and Hurricane Floyd (1999); and EOC activation in response to the World Trade Center and Pentagon terrorist attacks (2001).

2 Exploratory Review

2.1 Methodology

In the fall of 2006, the Federal Coordinator for Meteorology wrote letters to the Mayor of Mobile, Mr. Samuel Jones, and to the Mayor of Charleston, Joseph P. Riley, requesting their approval to conduct the exploratory review and also seeking assistance from their staff. The Federal Coordinator for Meteorology also wrote letters to Ms. Cathy Haynes (Director of Charleston County's EPD), Mr. Thomas F. O'Brien, Jr. (Deputy Director of Technical Services, Engineering Division of the City of Charleston), and Mr. Walt Dickerson (Mobile County Emergency Management Agency Director) requesting their support and assistance in the exploratory review. The Federal Coordinator for Meteorology received the full support of the Mayors and the leaders of emergency management operations for Mobile and Charleston areas.

The Federal Coordinator for Meteorology then formed teams to accomplish the exploratory review. For Mobile County, the team consisted of a senior staff meteorologist, Mr. Tim Ross, and a hazards communications consultant, Ms. Naomi Moye. Ms. Moye was under contract with the Science and Technology Corporation (STC), the OFCM Support Contractor. For Charleston County, the team consisted of Mr. Tim Ross, and a sociologist, Dr. Betty Hearn Morrow. Dr. Morrow was also under contract with STC.

During the winter of 2006-2007, the OFCM teams conducted interviews with representatives from agencies and organizations directly associated with Mobile County EOC (Mobile, Alabama and environs) operations and also with Charleston County EOC operations. In this report, these groups are referred to as "EOC entities." A sample of the questionnaire that was used to guide interviews is at Appendix A. However, the interviews were only semi-structured in order to allow the exploration of topics that might emerge. The teams also interviewed representatives from organizations not directly associated with EOC operations, such as schools, hospitals, homeless centers, nursing homes and religious organizations (referred to as "non-EOC entities") in order to understand how groups with special needs were receiving and responding to tropical cyclone information. In some cases this included administrators from local municipalities.

Specifically for Mobile County, in early December of 2006, the Emergency Management Director for Mobile County, Mr. Walt Dickerson, hosted a meeting at the Mobile County EOC with more than 60 people in attendance. At the meeting, the Federal Coordinator for Meteorology described the review and requested assistance from the attendees. Mr. Dickerson reinforced the importance of the review and requested the participation of the attendees. Ms. Moye and Mr. Ross set up meetings with the attendees for later in the week. A total of 75 interviews were conducted. Sixty-eight of the interviews were conducted in-person at the Mobile County EOC or other various public and private agencies. Seven interviews were conducted over the phone. When necessary, there were additional follow up emails and faxes for all interviews to obtain additional information.

For Charleston County, South Carolina, in late January of 2007, the Emergency Management Director, Ms. Cathy S. Haynes, in coordination with the city of Charleston's emergency manager, Mr. Tom O'Brien, hosted a meeting with about 25 people in attendance. At the meeting, Mr. Ross, on behalf of the Federal Coordinator for Meteorology, described the exploratory review and requested the assistance of the attendees. During the remainder of that week, Mr. Ross and Dr. Morrow conducted interviews of numerous entities. Most interviews were conducted in-person, but a few occurred by telephone. Most were recorded and transcribed for analysis. When necessary, follow-up emails or phone calls were made. Additionally, Dr. Morrow attended a regularly scheduled meeting of the local chapter of Volunteers Active in Disasters (VOAD) with 22 representatives from local governmental and non-governmental agencies involved in tropical cyclone response.

To review, the focus for the exploratory review was the information flow and receipt of tropical cyclone information. ***The emphasis of the review was the tropical cyclone information flow from the emergency management community to various community organizations/entities and to local residents.***

2.2 EOC and Non-EOC Entities Participating in the Review

The EOC and non-EOC entities participating in this review for Mobile County and Charleston County are summarized in Tables 2-1 and 2-2, respectively. To keep the review as consistent as possible across the two locales, the OFCM teams attempted to contact similar type organizations at both locales. However, differing structures and processes lead to the involvement of somewhat different organizations, particularly the non-governmental organizations assisting those with special needs.

2.3 Communications Capabilities of Mobile Emergency Management Agency and Charleston Emergency Management Division

During emergency situations such as landfalling hurricanes, MCEMA and CCEPD personnel communicate with entities within their EOC and with EOC entities in the field via many methods. Additionally, EOC personnel have the capability to communicate with each other, whether they are physically located within the EOC or are located elsewhere. Finally, MCEMA and CCEPD have mechanisms to communicate with citizens within their jurisdiction. The remainder of this section describes these communications capabilities

Table 2-1. Mobile County, Alabama: Entities Participating in Exploratory Review

Name of Entity	Type of Entity
EOC Entities[a]	
City of Bayou la Batre (Mayor's office, Fire, Police, Schools)	Local Government
City of Prichard (Mayor's office, Fire & Police)	Local Government
Town of Dauphin Island (Mayor & other offices)	Local Government
City of Citronelle	Local Government
City of Mobile (Mayor's office)	Local Government
Mobile County (Commission, 911, & DHS)	Local Government
The Wave Transit	Local Transportation
Mobile Fire & Rescue (Communication & EMS)	Local Government
Springhill Medical Center	Health Organization
Mobile County Public Health	Local Government/Health Organization
City of Chickasaw (Mayor, Police, Public works)	Local Government
Mobile County EMA	Local Government
Mobile County Public Schools	Local Government
Mobile County Police	Local Law Enforcement
NWS WFO Mobile	Federal Government
American Red Cross	Local Chapter of National NGO
Saraland Fire Department	Local Government
Volunteer Mobile	Local NGO
Non-EOC Entities[a]	
Mostellar Medical Center	Health Organization
BPSOS Boat People	NGO
HUD Housing Inspector / FEMA Liaison	Federal Agency / Local Office
Independent Living Center of Mobile	Independent Living Center
Volunteers of America Southeast	NGO
Center for Healthy Communities	Higher Education NGO
University of South Alabama	Higher Education
Pastors of Churches	Religious Organization
Advocates for the Deaf (Captionist, Sign Language Interpreter)	Business
Television Stations	Local Media
The Weather Channel	National Media
Portersville Revival Group	Community Organization
Mobile Press Register	Local Newspaper
Bayou Clinic	Health Organization
Assisted Living Facilities	Private Business
Advocate for the Blind	NGO
HHS	Federal Agency / Local Office
Alabama Disability Advocacy Program	NGO

[a] **Refer to the "Methodology" section on page 11 for further discussion on EOC and non-EOC entities.**

Table 2-2. Charleston County, South Carolina: Entities Participating in Exploratory Review

Name of Entity	Type of Entity
EOC Entities[a]	
Sheriff's Reverse 911	Local Government
Spanish Translator	Local Government
Local American Red Cross Chapter	NGO
City of McClellanville Administrator	Local Government
City of Awendaw Administrator	Local Government
CARTA	Local Transportation
City of Charleston Managers	Local Government
County Director of Radio Telecommunications	Local Government
Charleston County EOC Staff	Local Government
Public Health District Director	State Government
Emergency Management Director	Local Government
SC Office of Public Safety	State Law Enforcement
SC Dept. of Environmental & Health Control (DHEC) Emergency Response Coordinator	State Government
Charleston County Public Information Officers	Local Government
NWS Weather Forecast Office	Federal Government
Non-EOC Entities[a]	
Director Rehabilitation Center	Medical Facility
Tri-County Family Ministries	Religious Organization
South Carolina Port Authority	Maritime Industry
Director, United Methodist Relief	Religious Organization
General Manager, Tanger Outlet	Local Business
Executive Director, Crisis Ministries	NGO/Religious Organization
Our Lady of Mercy Church	Religious Organization
Rural Mission Migrant Head Start	NGO
Charleston Center Drug Rehab	Medical Facility
Presidents of Neighborhood Associations	Community Organization
American Red Cross	Local Chapter of National Organization
Voluntary Organizations Active in Disasters	NGO
Parochial School Principal	Religious Organization
Vision Impaired Activist	Local Government
DHEC Fisheries Enforcement	State Government
DHEC Coastal	State Government
Convention and Visitors Bureau	Local NGO
East Cooper Medical Center	Medical Facility
South Carolina School for the Deaf and Blind	State Education

[a] **Refer to the "Methodology" section on page 11 for further discussion on EOC and non-EOC entities.**

2.3.1 Mobile County Emergency Management Agency

Communication with EOC Entities

Web EOC

The MCEMA and EOC members have started using a new Web-based system called WebEOC. It is a web-based crisis information system used as the primary communication system. In the future, some EOC members will not need to travel to the EOC but can remain in their offices and communicate via WebEOC. However, even when the system is totally operational, MCEMA will still require agencies to send key personnel to the EOC. Another benefit of WebEOC is that it improves the ability to share critical incident information beyond the confines of the EOC via the Internet.

Mobile Radio Communications

The MCEMA communication system has at its core about 4,500 handheld 800 MHz radios. Every public agency in Mobile County, with the exception of Mobile City, uses the 800 MHz Enhanced Digital Access Communication System (EDACS) radios. The 800 MHz EDACS is compatible with the State's system. The radios used by the City of Mobile are a different type, but they have a cross-band patch from their system to the county EDACS system for mutual aid. Entities that use the 800 MHz EDACS include police and fire departments of all the municipalities within Mobile County (not including the City of Mobile), and all county agencies such as Sheriffs Offices, EMA, and Emergency Medical Services (EMS). Mobile City plans to switch to the EDACS within the next 18 months.

The 800 MHz has a dedicated channel for weather information. Weather warnings and other messages issued by the NWS are transmitted over this channel automatically. The NWS WFO also has an 800 MHz EDACS radio. Some of the smaller communities felt that there were not enough 800 MHz radios and desired more for their staff.

If all other communications fail, the Marine band radio is available through agreement with a commercial provider. The Marine band would be used to communicate with National and State agencies.

Telephones—Landline, Cellular and Satellite

The MCEMA EOC is equipped with 100 telephone lines, with an additional 100 in place should they be needed. It also has access to four satellite telephones. Southern Linc cellular phones provide another communications capability. The Southern Linc is a cellular phone system operated by the Southern Power Company. While Southern Linc is a cellular phone system, it is covered by a wireless priority service which guarantees the availability of circuits when regular cellular service may be jammed or compromised.

Communication with Citizens

The communications systems described above, along with local area networks, Internet, email and facsimile, covered communications methods among EOC personnel and between EOC and other key public personnel associated with the EOC (e.g., police, fire department, etc.). This section provides information on how the MCEMA communicates important information to citizens within Mobile County.

Broadcast Television and Radio

Public Information Officers (PIOs) are on duty at the EOC and provide updates to local television and radio stations personally. The local television media have on-screen meteorologists. They monitor the formation and movement of tropical cyclones closely. They broadcast MCEMA-specific information approved by the Director of the MCEMA and received from the MCEMA PIOs.

During a storm, all citizens that have power and access to a television and/or radio should have access to the latest information disseminated by the MCEMA PIOs. For local television, NBC Channel 15 WPMI is the only station in the Mobile market that has real-time closed captioned coverage for the deaf or hearing impaired. Virtually every respondent interviewed monitors television and/or radio. Many respondents watch the local television stations and The Weather Channel (TWC). The MCEMA communicates with TWC to coordinate automatic dissemination of information.

Dial-logic

The MCEMA also has an automatic dialing system called Dial-logic. Dial-logic is available for making direct phone calls to small areas. It is used primarily for contacting Dauphin Island with evacuation messages; the EOC does not have all of the phone numbers for non-resident owners. This system has limited capability due to the small capacity of numbers that can be called. The need for a telecom system that will improve reaching the masses within Mobile County still exists.

Amateur Radio

Amateur radio communications, through the local Radio Amateur Civil Emergency Service (RACES), are used as another method of communicating information to some citizens. This communication method is considered the last line of local communication. In addition to providing communication between the EOC and NWS, amateur radios are located at shelters and other important locations. The RACES operators provide storm reports as well as a means of disseminating information.

NOAA Weather Radio All Hazards

NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from a nearby National Weather Service office. NWR broadcasts National Weather Service warnings, watches, forecasts and other hazard

information 24 hours a day. NWR has the capability of transmitting messages in English and Spanish. Additionally, NWR is capable of reaching people with hearing loss in emergencies, by imbedding non-verbal information in the broadcasts. Special NWR units with Specific Area Message Encoding (SAME) can set off an alarm for specific events (e.g., tornados, flash floods, evacuations) and locations. Some receivers are also equipped with special output connectors that activate non-verbal alerting devices such as bed/pillow shakers and strobe lights.[20]

Most of the organizations associated with the Mobile County EOC were familiar with NWR and used it to receive NWS weather information.

The community of Chickasaw purchased 25 receivers to locate with influential community members. In addition, all public schools have NWR. Knowledge and use of NWR by non-EOC entities varied considerably. One person indicated that her community "lived and died by NWR," while all of the ministers that participated in the review were unfamiliar with NWR.

MCEMA messages can be transmitted over NWR by the NWS.

Police Patrol

During warning situations, the police patrol locations where homeless congregate to give information on the storms and locations of available shelters. The police will also patrol in other locations and knock on doors if necessary in voluntary and mandatory evacuation areas to alert citizens of an impending storm.

Sirens

Another communications capability of the MCEMA is sirens. The 47 sirens in the county were previously only used for local alerting of hazardous material spills. In April 2007, Mr. Dickerson initiated new policy which mandates that sirens will be used in the future for tornado warnings, technological occurrences and other severe weather events. At present, almost all the existing sirens are located on the eastern side of the City of Mobile. After MCEMA conducted a siren study it was determined that there is an urgent need for a total of 107 sirens. More sirens are needed for increased coverage area due to population increase, expansion and new industry growth on the western side of the city and to replace old sirens that are 50 years old.

2.3.2 Charleston County Emergency Preparedness Division

Communication with EOC Entities

Web EOC

Charleston County EOC members, as do all of South Carolina's emergency managers, use WebEOC. The WebEOC system was previously described in section 2.3.1.

The EOC facility, equipped with monitors and telephones, can handle 60-80 people during activation. The CCEPD staff is augmented by employees from other government agencies who have been trained to assume new roles during emergencies. Others with regular places in the

EOC include representatives from municipalities, hospitals, educational institutions, major businesses, and NGOs serving citizens with special needs. All are connected via WebEOC regardless of whether they are physically located within the EOC facility.

Mobile Radio Communications

The CCEPD communication system has at its core about 5,500 handheld 800 MHz radios. Every public agency in Charleston County, with the exception of Charleston City, has Motorola 800 MHz Enhanced Digital Access Communication System (EDACS) radios. Charleston City has 800 MHz, but of a different type. However, the two different radios are compatible so they are still able to communicate. The 800 MHz radios used for day-to-day, routine operations as well. Since it is expected that a major landfalling hurricane could destroy the communication towers that support the 800 MHz, the State Office of Public Safety has plans to use Civil Air Patrol aircraft as flying relay antennas until mobile replacement antennas, maintained by the South Carolina Department of Health and Environmental Control (DHEC), become operational. If needed, the DHEC expects to have these antennas in operation within 2 hours.

Telephones— Cellular and Satellite

Before the EOC is activated, the CCEPD uses an email system called INFORAD to notify everyone involved with emergency management of any situation related to emergency management. These text messages go out to nearly 600 cellular telephones. As a backup communication, all involved with emergency management have cell phones with guaranteed channel availability. If there is active cell phone coverage, they will have channels available.

The EOC has one satellite phone, supplemented by several others that can be added from other county agencies in an emergency. The city of Charleston is purchasing 25 for key personnel. They would be used as a mobile last line of communication or for the highest levels of government to communicate. This system is the most expensive to own and operate.

Communication with Citizens

The communications systems described above, along with local area networks, Internet, email and facsimile cover communications methods among EOC personnel and between EOC and other key public personnel associated with the EOC (e.g., police, fire department). This section provides information on how the CCEPD communicates important information to citizens within Charleston County.

Broadcast Television and Radio

When the EOC is activated, a systematic, briefing schedule is established. An area of the building housing the EOC, the Joint Information Center (JIC), is set aside for the media including power and video/sound feed hook-ups. The media is very amenable to providing tropical cyclone information.

Two Public Information Officers (PIOs) employed by the County support the EOC. They work alternating 12 hour shifts during tropical cyclone events. They are supported by PIOs from other public offices as well as private entities, such as the Charleston Visitor and Convention Bureau.

While the other PIOs draft press releases and provide information, the County PIO has the final approval on all press releases. All members of the EOC can use WebEOC to request that information be included in press releases. These releases are created, cleared and archived through the use of WebEOC. All releases are date-stamped with expiration times. The press releases are displayed on the county web pages that are Americans with Disabilities Act compliant. These press releases are transmitted to about 100 different entities including The Weather Channel (TWC). These messages are scrolled at the bottom of the screen by TWC during the local weather broadcast.

In addition to broadcasting the EOC briefings, the local television media have on-screen meteorologists. They monitor the formation and movement of tropical cyclones closely. Virtually every entity interviewed monitors television to one extent or another to stay abreast of the latest tropical cyclone news. All the officials and broadcasters reported excellent relationships with and service from the local National Weather Service office.

Geographical Information System (GIS)-Based Reverse 911

The county Sheriff's Office has a GIS-based Reverse 911 system. Only nine lines are available for making calls so the system is limited to use for notifying small areas of the county for short-fused events for reasons such as lost children and Alzheimer patients, alerts for burglars, or hazardous materials spills. It could be used to notify small regions about the establishment of specific counter-flow routes during evacuations. The operator annotates an area on the map where they want the calls to be placed and the system calls every listed number within that area and voices a message recorded by the operator. This system has never been used for widespread dissemination. Mt. Pleasant also has a reverse 911 system with similar capabilities.

The South Carolina Emergency Management Division operates a Reach SC statewide 911 system that it can activate for emergencies. As one example, it can be used to notify residents in areas to be evacuated for tropical cyclones.

Telephone Bank

Up to 12 people staff a telephone bank 24-hours a day to answer questions of citizens. There is also a dedicated telephone number for those who speak Spanish or who are deaf to call. These numbers are well advertised.

Amateur Radio

Amateur radio communications, through the local Radio Amateur Civil Emergency Service (RACES), are another method of communicating information to some citizens. This can be considered a last line of local communication. In addition to providing communication between the EOC and NWS, amateur radios are located at shelters and other important locations. The RACES operators provide storm reports as well as a means of disseminating information.

NOAA Weather Radio All Hazards (NWR)

The NWR was previously described in section 2.3.1. The Charleston National Weather Service Forecast Office can and does transmit CCEPD messages via NWR, but South Carolina is not yet

set up to use the All Hazards feature allowing the emergency managers to transmit emergency messages automatically. One surprising finding of the review was that most of the non-governmental agencies participating in this review did not have NWRs in their offices or facilities.

Police Patrol

In areas where there is a lack of mass communication, the police patrol the streets making announcements over loudspeakers. This is done in mobile home parks during evacuations, for example.

United Way 2-1-1 Service

Another source of citizen information during an emergency is the regular 2-1-1 service offered by United Way. Representatives from United Way attend the VOAD meetings and participate in emergency management response.

Neighborhood Associations

The city of Charleston has an innovative process for promoting government-citizenry interaction. The Mayor's office has a full-time employee dedicated to developing and sustaining neighborhood associations. Any neighborhood desiring to participate submits a petition to a special board set up for this purpose, elects officers and becomes a part of the network. Regular two-way communication occurs with the Mayor's office through emails, newsletters and regularly scheduled meetings. Each neighborhood association is then responsible for communicating with its neighborhood using newsletters, email, telephone trees, etc. At the time of the exploratory review there were 100 Neighborhood Associations, reaching at least 100,000 citizens, and covering areas varying in economic development, age, social class, and ethnicity. Section 2.4.2 has more information on this program.

Siren

The city of Charleston has one siren which is used for local alerting of hazardous material incidents. The city does not plan to acquire additional sirens. Outlying municipalities such as McClellanville and Awendaw do not have sirens, but the administrators interviewed for this study expressed support for the idea. They were especially concerned about how their citizens would be notified for events occurring at night.

2.3.3 Summary of Communications Capabilities

These emergency managers receive all of the local National Weather Service Forecast Office's tropical cyclone products and are in direct communication with local NWS forecasters during a tropical cyclone event. Using this information, along with advisories from the National Hurricane Center/Tropical Prediction Center, the public officials and emergency managers determine what action is deemed necessary. Mobile and Charleston County's EOC entities—those located in the EOC and those in the field associated with the EOC—receive the latest

information via many methods. Likewise, citizens of both Mobile and Charleston Counties receive emergency management information through a variety of methods and channels. Table 2-3 summarizes the communications capabilities discussed in sections 2.3.1 and 2.3.2 above.

2.4 Further Discussion Regarding Information Flow to Citizens

With constant media coverage (e.g., television, radio, newspaper) regarding tropical cyclones, along with updates available from computer sources (e.g., Internet) and NOAA Weather Radio All Hazards, it is highly likely that the majority of the population has access to the latest information on tropical cyclones, including evacuation decisions/information. However, past events indicate that a portion of the U.S. population does not receive adequate information about approaching tropical cyclones or the information they receive is not interpreted adequately to make appropriate decisions to protect themselves and their property.

An area of concern noted at every level of emergency management in Mobile and Charleston Counties was the receipt of vital tropical cyclone information for citizens in outlying areas and those with special needs (e.g., the, elderly, disabled, non-English speaking and those with medical concerns) or people with special work or living circumstances that may isolate them from regular sources of communication (e.g., the homeless and migrant farmworkers).

Table 2-3. Communications Capability of MCEMA and CCEPD during Tropical Cyclone Events.

COMMUNICATION AMONG EOC RESPONDERS	
MOBILE (MCEMA)	**CHARLESTON (CCEPD)**
Mobile Radios (800 Mhz) Landline Telephones and Fax Machines Cell phones Satellite Phones (four) Local Area Network WebEOC	Mobile Radios (800 Mhz) Landline Telephones and Fax Machines Cell Phones Satellite Phones (limited number) Local Area Network WebEOC
COMMUNICATION WITH CITIZENS	
MOBILE (MCEMA)	**CHARLESTON (CCEPD)**
National Weather Radio Mass Media: TV and Radio Dial-Logic Amateur Radio Newspapers Internet Website Police Patrols and Speakers	National Weather Radio Mass Media: TV and Radio County and State Reverse 911 United Way 2-1-1 Service Amateur Radio Newspapers Internet Website Police Patrols and Speakers Neighborhood Associations

2.4.1 Information Flow to Citizens with Special Needs—Ongoing Local Efforts in Mobile County

Many entities in the Mobile County area are proactive in helping to improve the dissemination of tropical cyclone information. One example is a major feat undertaken by the MCEMA, the Independent Living Center of Mobile, "Volunteer Mobile" and other organizations to create a special needs evacuation registry (http://www.disasterhelpmobile.org). The registry will be used to ensure that that people with special needs can get to safety when a hurricane hits. About four days prior to a storm making landfall, officials and numerous volunteers call citizens in the registry and make sure everyone has a plan for evacuation.[21] **Calling everybody on the registry is obviously a very laborious process, but there may be automated mechanisms available in the future as improvements to the public alert and warning system evolve (see section 1.3).**

Many mechanisms are available to facilitate signing onto the registry. In addition to the special needs evacuation registry web site, hard copy sign-up forms are being made available in Vietnamese, Cambodian, Laotian and Spanish. The Wave Transit System that serves the Mobile, Alabama, area may incorporate sign-up forms in their offerings to paratransit riders. Additionally, local churches, community groups, health agencies and WHIL Radio Reading Service for the Blind are also getting involved.

2.4.2 Information Flow to Citizens with Special Needs—Ongoing Local Efforts in Charleston County

Charleston County has a plan in place to provide transportation for citizens that need it to get to a shelter and there is a shelter designated for citizens that have minimal special needs. Charleston County and the City of Charleston jointly posted permanent signs marking Evacuation Pick Up points (75) throughout the county. The City posted the signs in the city limits, while the County posted the remainder.

Charleston County does not have a special needs registry. It was tried in the past, but there were insufficient resources to accomplish this astronomical task. However, the city of Charleston does maintain a registry. Neighborhood Association presidents are given forms to complete for neighbors with special needs. The city will then try to obtain the necessary information or locate assistance for them, using the services of the fire and police, if needed. During emergencies, Neighborhood Association presidents are contacted by the Mayor's office at regular intervals via email and telephone. Presidents then use their regular channels, including telephone trees, to relay the information to neighbors.

The local utility company, South Carolina Electric and Gas, maintains a registry of clients with medical equipment dependent upon power. It updates the list annually and works with each client to have the necessary backup plan or equipment.

During the review, two groups emerged as being underserved – the homeless and farmworkers. The agencies serving the homeless do not assume responsibility for their evacuation for various reasons, including liability issues. The reported method for letting them know of an evacuation was "to get the word out on the streets." There were reports from shelter supervisors that the

homeless, many with mental illness, arrived with no supervision. There appears to be no established method of notifying migrant farmworkers, such as those on St. Johns Island, of tropical cyclone warnings. The local mission working with this population does not have NWR, but relies on getting the information from television or radio and sending it out to the farmers and fields. The representatives interviewed did not believe most farmworkers understood watches and warnings.

3 Major Observations and Follow-on Considerations

3.1 Major Observations

Both Mobile and Charleston Counties are served by outstanding emergency management operations. The MCEMA and CCEPD staffs participate in local, state and national training programs and have extensive citizen outreach and education programs. Both organizations are very fortunate to have a cadre of public and private officials that, for the most part, have a great deal of experience with tropical cyclones events and a drive to further improve emergency management operations. Additionally, the MCEMA and CCEPD receive strong support from the political leadership within their jurisdictions. The support, leadership and mutual respect help to ensure one consistent message is disseminated from the MCEMA and CCEPD to citizens throughout the Mobile and Charleston County areas.

The communication capabilities in Mobile and Charleston County are dependable and redundant and mostly interoperable. A constant requirement specified by interviewees, in addition to the communications capabilities identified in Table 2-3, was for a mass communication system with the ability to target specific populations and/or geographical areas. With the diverse populations that exist in communities it is clear that multiple, redundant systems are needed to ensure every citizen receives vital tropical cyclone information. Specifically for Mobile County, there is an urgent need to replace some of the 47 existing sirens that are over 50 years old. A total of 107 are needed for the Mobile County area. Once these sirens are acquired, a more extensive outreach and education program will be needed. **Additionally, Mobile and Charleston County's emergency management operations could be enhanced with improved public alert and warning systems (see section 1.3).**

3.2 Follow-on Considerations

Table 3-1 summarizes the follow-on considerations that emerged from the exploratory review.

3.3 Applicability to Other Extreme Weather Events and Technological Hazard Events

The focus of this exploratory review was the information flow and receipt of tropical cyclone information. Although the focus was associated with tropical cyclones, the exploratory review and information dissemination is also applicable to other extreme weather events, such as flooding, severe thunderstorms and tornadoes, heat waves, and severe winter storms (e.g., wind/snow/ice storms). Additionally, the review is applicable to technological hazard events, including hazardous materials incidents and nuclear power plant failures.

Table 3-1. Follow-on Considerations

#	ITEM	REMARKS
1	Overarching Focus on the Entire Demographics of the At-Risk Population	Mobile and Charleston Counties and the entire network of public and private entities involved in improving the public alert and warning system (see section 1.3) should continue to account for the entire demographics of the at-risk population—especially the poor, elderly, the disabled, non-English speaking and individuals with medical concerns—ensuring the entire at-risk population has a mechanism and support systems to receive tropical cyclone information. The goal is to promote preparedness so that citizens can take the necessary actions to save lives, reduce injuries and protect property. Additionally, the needs of citizens in outlying areas should be considered in the improvement efforts of the public alert and warning system.
	-- Integrated Public Alert and Warning System (IPAWS)	-- Mobile and Charleston Counties should be given high priority for inclusion in the pilot projects under the umbrella of the IPAWS (see section 1.3). Specifically, the counties should be included at the earliest possible opportunity in the Digital Emergency Alert System, Geo-Targeted Alerting System and DHS Web Alert and Relay Network. As Mobile and Charleston Counties are brought into the pilot projects, pertinent information and lessons learned at the county level should be provided to applicable points of contact for the various IPAWS projects.
	-- NOAA Weather Radio All Hazards (NWR)	-- Consider using NWR to aid in disseminating vital information, including evacuation notices. NWR could be placed in locations where various populations congregate to ensure real-time, vital tropical cyclone information and evacuation notices are received. Currently, NWR would be most effective where the population speaks English or Spanish.
2	Community-Based Organizations	Community-based organizations (e.g., churches, civic groups, NGOs) should be encouraged to form notification call trees and other means to further disseminate information. These outgoing calls from a trusted source would reinforce the urgency of adhering to the instructions contained in the message and help spur appropriate action from citizens. These groups can also serve as sources for populating databases of people with special needs.
3	Nation's Forecast and Warning Program—Warning Message Content	Although not the focus for this exploratory review, efforts should continue by applicable agencies/entities to review the content of warning messages. The review should entail working with user groups to develop and test warning message format/content modifications to optimize desired outcomes.

3.4 Summary

Disseminating tropical cyclone information and other alert and warning messages is akin to making and selling a product or service in the world of business—with one major difference—a business owner knows that they cannot reach every customer or make every sale. When it comes to alerts and warnings, every resident of an affected region is a customer who cannot be bypassed and who must be "sold." Just as a manufacturer does not just make a product and hope someone buys it, the entities involved in public alert and warning dissemination must become adept at marketing warnings, accounting for the entire demographics and understanding the sociological aspects of the alert and warning process.

Both Mobile and Charleston Counties have outstanding emergency management operations including excellent administrators, first-rate political support, and sufficient facilities and

equipment. However, operations could be improved through an enhanced public alert and warning system that is currently under development. Follow-on Consideration #1 in Table 3-1 reads: the entire network of public and private entities involved in improving the public alert and warning system (see section 1.3) should continue to account for the entire demographics of the at-risk population—especially the poor, elderly, the disabled, non-English speaking and individuals with medical concerns—ensuring the entire at-risk population has a mechanism and support systems to receive tropical cyclone information and take the necessary actions to save lives, reduce injuries and protect property.

Accounting for the entire demographics of the at-risk population is not a simple task. The following is extracted from the GAO report, *Current Emergency Alert System Has Limitations, and Development of a New Integrated System Will Be Challenging*:[22]

> In addition to these technical challenges, stakeholders have noted that other challenges currently facing EAS will also face an integrated system, including the challenges associated with accessibility, training, and funding. FEMA, for example, has said that the difficulties involved in making EAS alerts accessible to non-English speakers and to the disabled will likewise be barriers to the development of an integrated alert and warning system. Similarly, the Congressional Research Service has observed that incorporating technologies that expand the reach of EAS for people with special needs, such as those with disabilities, the elderly, and those who do not understand English, at a reasonable cost, is one of the challenges of delivering an effective warning system that is truly nationwide.

Even though there will be challenges to ensure improvements in the public alert and warning system account for the entire demographics of the at-risk population, this exploratory review underscored that this should remain a priority. In these two case studies, officials and organizational representatives demonstrated a commitment to reaching citizens with special needs in a timely manner. This capability will further improve as dedicated emergency management officials, like those in Mobile and Charleston County, have access to enhanced public alert and warning systems that take advantage of burgeoning technology.

APPENDIX A
SAMPLE QUESTIONNAIRE USED TO GUIDE INTERVIEWS

Name: _____
Employer Name: _____
Employer Address: _____
_____
Work Phone: _____
E-mail Address: _____

The following is a list of products that could be transmitted during the tropical cyclone season. Our goal is to identify which of these messages are used by, or are of most importance, to different stakeholders and then ask the first nine questions about each product. Questions 10-17 will give us more information about how the entity uses the tropical cyclone information once they receive it.

TPC/NHC Products:

See the Web site http://www.nhc.noaa.gov/aboutnhcprod.shtml for a full description of TPC/NHC products.

Example Local WFO Products:

Hurricane Local Statements

Flood Watch/Warning Statement

Flood Warning

Tornado Warning

Severe Thunderstorm Warning - hail 3/4 inch diameter or larger hail and damaging thunderstorm winds are expected to occur

Severe Weather Statement

Marine Weather Statement

1. Regarding the product list above, please tell us those you use most frequently and for each product answer the following questions:
    a. Was it timely?
    b. Is the message understandable?
    c. What do you think of the format?

d. Does the information you receive meet your needs?

2. How do you rate your overall satisfaction with the information you receive (whether from product list of from elsewhere?)
3. Is there one central point of contact in your agency that handles receipt of these messages?
4. Is there one central point of contact in your agency that handles the transmission of these messages?
5. How and from where do you receive the message?
    a. Primary method:
    b. Secondary method:
    c. Tertiary method:
6. -- What do you do if there are conflicts between the different sources?
7. **(Other than evacuation decisions)** How do you use this message?
    a. Do you take action?
        i. Are there forecast thresholds that signal you to take action?

        -- What are these thresholds and what action do you take for each?

        -- Are the thresholds tied to the Saffir-Simpsom Storm Category?

If needed, the Saffir-Simpson scale is:

I Winds 74-95 mph (64-82 kt or 119-153 km/hr); storm surge generally 4-5 ft above normal

II Winds 96-110 mph (83-95 kt or 154-177 km/hr); storm surge generally 6-8 feet above normal

III Winds 111-130 mph (96-113 kt or 178-209 km/hr); storm surge generally 9-12 ft above normal

IV Winds 131-155 mph (114-135 kt or 210-249 km/hr); storm surge generally 13-18 ft above normal

V Winds greater than 155 mph (135 kt or 249 km/hr); storm surge generally greater than 18 ft above normal

        ii. Are actions tied to storm surge forecasts?

        -- What storm surge level is critical and what action do you take?

        iii. Are actions tied to flood forecasts?

        -- What flood height is critical and what action do you take?

        iv. Are actions tied to other criteria?
    b. Do you use the information for planning? (e.g., for preparation, mitigation or response)
8. **(For the evacuation decision process)** How do you use this message for evacuation decisions?
    a. Do you take action?

i. Are there forecast thresholds that signal you to take action?
   -- What are these thresholds and what action do you take for each?
   -- Are the thresholds tied to the Saffir-Simpsom Storm Category?
ii. Are actions tied to storm surge forecasts?
   -- What storm surge level is critical and what action do you take?
iii. Are actions tied to flood forecasts?
   -- What flood height is critical and what action do you take?
iv. Are actions tied to other criteria?

9. To whom do you disseminate (pass) this information to?
   a.
   b.
   c.
   d. Others
10. How do you disseminate (pass on) this message? (refer to attachment 1 for other examples)
   a. Face to Face
   b. Land line telephone
   c. Cellular phone
   d. Satellite phone
   e. Email
   f. Text messaging
   g. Transcribe to another electronic system
   h. Decision Support System
   i. NOAA Weather Radio All Hazards
   j. FTP
   k. Fax
   l. Reverse 911
   m. Sirens
   n. Bullhorns
   o. World Wide Web
   p. Media
      i. Radio
      ii. TV
      iii. Print Media

iv. World Wide Web

q. Other (e.g., electronic billboard, roadside signs etc.)

11. Do you edit the message prior to further dissemination?
12. Once you disseminate the message, do you receive confirmation the information was received?
    a. How do you track confirmation?
13. Are there obstacles to your dissemination activities?
    a. Do you have sufficient resources (people, technology) to adequately disseminate the message?
    b. What technology do you need that is not available to you at this time?
14. Do you have written standard operating procedures, databases, or checklists for tropical cyclone message dissemination?

    -- If so, can you share them with OFCM electronically?

    --- By mail or FEDEX?
15. Can you identify other stakeholders in this process that receive the disseminated tropical cyclone information (other than stakeholders in #5)?
16. Can you identify other stakeholders in this process that should receive tropical cyclone information directly disseminated from you (see #8 above) but are not currently identified in your dissemination list?
17. Do you have public education and communication programs on storm impacts?
    a. Before an event?
        i. How?
    b. During an event?
        i. How?
    c. After an event?
        i. How?
18. How familiar are you with NOAA's role in the dissemination of tropical cyclones information?

ENDNOTES

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