

Transit Evacuation Planning: Two Case Studies

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16. Abstract <p>This project addresses the emergency transit evacuation of individuals without personal vehicles or the means to acquire them during extreme coastal events. It is a joint effort of the University Transportation Center for Alabama (UTCA) and the Center for Transportation Policy Studies (CTPS) at the University of North Carolina Charlotte, and uses Mobile, AL, and Wilmington, NC, as simultaneous case studies. The research provided insight into the population most at risk (vulnerable population) and key factors in planning for transit evacuation of that group.</p> <p>Some of the primary contributions of this research were: (1) identification of characteristics of members of the vulnerable population, (2) use of current guidance to estimate the potential size of the transit-dependent population during a major hurricane event, (3) documentation of the large gap between the estimated number of evacuees and the much smaller number that actually evacuated in recent Alabama and North Carolina hurricanes, and (4) providing information on how to effectively communicate with these individuals before, during, and after an emergency evacuation.</p> <p>In addition to conducting these case studies, the authors identified multiple topics that should be resolved to improve transit evacuation of the vulnerable population. These include the need for a research framework to identify and prioritize major issues that hinder transit evacuation, the lack of involvement by emergency communication experts, the lack of evaluation of the effectiveness of evacuation communication plans, and the need for a national clearinghouse of information on communication with and evacuation of the vulnerable population.</p>			
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Executive Summary

Mobile County is one of the two Alabama coastal counties exposed to the effects of hurricane storm surges, wind, and rain. The amount of danger the residents face depends on the intensity of hurricanes, the locations of the individuals, and the amount of prior preparation and planning by emergency agencies. During these events special-needs individuals are the primary endangered people because they require special assistance to evacuate and are not usually included in emergency-evacuation plans. Planning for this population segment proved to be difficult for emergency-planning agencies. Because special-needs populations are diversified and mostly isolated, it is difficult to identify, locate, and communicate emergency information with them.

Many states have developed evacuation plans for the general population, focusing on self-evacuating individuals. The need to plan for individuals who cannot self evacuate did not become clear until after Hurricane Katrina. At that point federal law changed to require planning agencies to include special-needs populations in their evacuation plans. However, lack of a nationally accepted definition for this population group has made the planning process more difficult. This is an important and often overlooked reality that is not yet addressed adequately by most states and local/county emergency-management agencies.

The main objectives of this study were (1) to identify and estimate the potential size of transit-dependent individuals during a major hurricane event and (2) provide information on how to effectively communicate with these individuals before, during, and after an emergency evacuation.

The study reviewed numerous reports and guidebooks published by federal and state emergency-management agencies. This was supplemented by contacting individuals working in the area of emergency management and evacuation of special-needs populations. It was found out that there is no nationally mandated definition for special-needs individuals and different states and planning agencies apply different definitions. In addition, it was shown that all states cannot have the same plan and that the plan should be adjusted with respect to the amount of resources and risk each state faces.

The study identified a variety of communication systems that can be applied in emergency-information communication. The systems' limitations and strengths in serving special-needs individuals were reviewed based on the literature. It was found that there can be no single communication system that can meet the requirements of this population segment. Therefore, use of multiple communication systems is recommended to ease the limitations.

During emergency situations many things could go wrong to cripple communication systems. Depending only on the primary communication systems may endanger many lives. Planning a

backup system and applying a combination of methods to meet the need of special-needs people are essential. In addition, it is essential to test communication capabilities of different communication systems with technologies that aid people with disabilities such as deafness.

The size of potential transit-dependent populations was estimated for Mobile County Alabama, using three datasets. The average of the three was approximately 34,500 residents. This estimate significantly differed from the actual number of evacuees during major hurricanes. It was suggested that it is better to be prepared for the worst conditions.

In addition to these results, the report contains in Part II a case study for Wilmington, NC. Part III – Appendix provides useful references for planning and conducting emergency evacuation of vulnerable populations, a review of the Mobile County Hurricane Plan, a sample plan from GEMA, a checklist, and a list of principal contacts.

Introduction

This report addresses emergency transit evacuation of individuals without personal vehicles or the means to acquire them during extreme coastal events. The project was conducted by the University Transportation Center for Alabama (UTCA) at The University of Alabama as project 08112. The project is a joint effort of UTCA and the Center for Transportation Policy Studies (CTPS) at The University of North Carolina Charlotte (UNCC). The project used Mobile, AL, and Wilmington, NC, as simultaneous case studies.

This report provides basic information about plan preparation and communication with the vulnerable population. It also estimates the potential number of transit-dependent individuals in Mobile County, AL, and provides a check list of the elements typically included in the plans for evacuation of transit-dependent individuals. Similar work was conducted at the UNCC CTPS. The two centers shared ideas and findings to improve the work at both centers. The UNCC CTPS project is included as Part II of this report.

Part I

Mobile County, AL, Case Study

Section 1 Introduction

Scope of the Project

This report provides an overview of some of the major issues involved with planning and conducting evacuations of individuals without vehicles. This includes major issues of transit-evacuation planning like the following examples:

- Estimation of the potential size of the vulnerable population.
- Information on how to effectively communicate with these individuals before, during and after an emergency evacuation.

Background Information

Alabama is a state along the Gulf of Mexico that is under constant threat from seasonal hurricane events. Mobile County is one of two coastal Alabama counties exposed to the effects of hurricane storm surges, wind, and rain.

Mobile County has a total estimated population of about 400,000, scattered through 10 cities and rural areas with the City of Mobile being the most populated. The residents' exposure or the amount of danger they face depends on the intensity of hurricanes, the locations of the individuals, the amount of prior preparation and planning by emergency agencies, and many other factors.

Based on information from the National Hurricane Center, the local television news indicates that since 1995 there have been seven major hurricanes that affected the Mobile Bay area. These were Hurricanes Erin, Opal, Danny, Georges, Ivan, Dennis, and Katrina (WKRG News 5 n.d.).

In addition to these major hurricanes, Hurricane Rita caused severe damage along the Gulf Coast to both Florida and Alabama. The I-10 Bridge over Pensacola Bay was seriously damaged by the storm surge. Alabama experienced extreme damage in Gulf Shores and Orange Beach and severe damage up to five miles inland. Beach-front utilities took more than two years to fully restore.

Hurricane Katrina was one of the deadliest and costliest hurricanes in US history. The highest storm surge reached 15 feet along Mobile Bay and crossed I-10 at many locations. It also caused flooding several miles inland. Katrina was so severe that afterward major changes were made to disaster-preparation plans. The storm caused devastating damage in Louisiana and Mississippi, where the death toll reached more than 1300 and 200 respectively. Most of these deaths were

attributed to the storm surge and surge-induced flooding. The saddest fact about Hurricane Katrina damage in Louisiana was that the majority of fatalities were persons above 60 years of age and transit-dependent (non-driving) individuals. Insufficient food, water, medical care, and security at the staging area (the Superdome) made things worse for this segment of the population (Knabb, *et al.* 2005).

The size and severity of the Hurricane Katrina disaster led agencies to learn from their mistakes. Plans now include greater detail about the critical components of evacuation such as communication, transportation, and sheltering of transit-dependent individuals. Planning regulations for transit-dependent individuals now call for the identification of needs, resources, and organizations responsible for evacuation of vulnerable populations. Also, the needs are required to be well integrated with the evacuation procedure for automobile evacuation.

Study Methodology

The primary component of this study was the review of a large number of reports and guide books published by federal and state emergency-management agencies. This was supplemented by interactions with the Wilmington case-study team at UNCC CTPS to share knowledge, data, procedures, and other research tools and methods. Conference calls, emails, and field visits were used to acquire additional information from state emergency-management agencies, technical organizations, consulting companies, and national experts. In addition, the UTCA team made multiple trips to Mobile to meet with Mobile County Emergency Management Agency (MCEMA) officials to acquire and exchange information.

Contents of this Report

Part 1 of this report deals with the Alabama case study and is divided into five sections. Section 1, Introduction, gives the project background. It explains why this study is needed and discusses the methodologies applied.

Section 2, State of Practice, discusses major issues in relation to hurricane evacuation, defines transit-dependent individuals, provides an overview of hurricane categories, and discusses evacuation practices in relation to transit-dependent individuals. It also provides a short review of the MCEMA hurricane-evacuation plan.

Section 3, Estimating the Evacuation Population, discusses the important issue of estimating the number of transit-dependent evacuees. It describes best practices and provides recommendations from different states and various studies about how to estimate the potential number of evacuees. This section also compares evacuation estimates with the number of people that actually evacuated for prior hurricanes and draws conclusions about the differences between the estimated and actual number of evacuees.

Section 4, Communicating with the Vulnerable Population, addresses communication of transportation-related issues with vulnerable populations. It also discusses the characteristics of these population groups, barriers to communication with these groups, and communication

techniques. It provides a foundation for developing communication procedures, policies, and strategies.

Section 5, Mobile Case Study Conclusions, contains basic conclusions and recommendations drawn from the Mobile case study.

Part II of this report is devoted to the Wilmington, NC, case study. It was prepared by the University of North Carolina Charlotte Center for Transportation Policy Studies.

Part III of this report contains appendices that provide useful resources. This includes identification of reference materials (complete with page numbers) for addressing the major components of preparing and using an evacuation plan that addresses vulnerable populations that do not have vehicles for use in evacuation situations. There is also a checklist to help MCEMA planners and others enhance their plans for evacuating transit-dependent individuals.

Section 2

State of Practice

Overview

Hurricanes are catastrophic events that cause major loss of life and environmental and structural damage. This destruction is primarily due to storm surges, but a significant amount of damage is also caused by high-speed winds. Hurricane severity is described using the Saffir/Simpson Hurricane Wind Scale, which categorizes hurricanes on a 1 to 5 scale based on their intensities. A category 1 hurricane has a wind speed of 74 to 95 miles per hour (mph), while a category 5 hurricane has a wind speed greater than 155 mph (NHC n.d.).

Evacuations are the primary means of protecting people in hurricane-prone areas. The Saffir/Simpson Hurricane Wind Scale plays a big role in making decisions about whether all or part of the population in a vulnerable area needs to evacuate. In most cases, individuals in coastal areas will need to evacuate from potential storm-surge areas and from shelters that do not provide protection for the forecasted winds and surges. For extremely powerful hurricanes, this might involve evacuating large numbers of people far inland to escape the wind and to find shelter.

Evacuation plans can be prepared for different kinds of extreme events such as hurricanes, wild fires, floods, or terrorist attacks. They can be prepared for population groups such as general populations, individuals in hospitals, and persons in nursing homes. Emergency planners try to prepare for the worst conditions and to include every population segment in their plans. The following section discusses evacuation planning in relation to transit-dependent individuals.

Major Topics for Planning and Conducting Transit Evacuations

Identifying and Estimating the Evacuating Population

Several studies have provided definitions of evacuating populations such as “special needs,” but this does not encompass all transit-dependent individuals. Other studies state that it is a broad group that includes several population segments such as individuals with low income, elderly, disabled individuals, and individuals with limited English proficiency. To avoid confusion, the definition of individuals in the transit-evacuation population for this report is presented in the next paragraph.

Transit-dependent individuals are individuals who may depend on transit for hurricanes or extreme coastal events. These may be individuals without personal vehicles or those who need mobility assistance. Individuals who need special medical attention are not included in this

report because their transportation and sheltering requirements are more complicated than other individuals. Also, in Alabama evacuation plans for individuals under medical supervision or receiving intensive care in nursing homes or hospitals are prepared by health organizations; they are not included in this report. Some of the categories of transit-dependent evacuees are provided later in this report.

Data on this segment of the population are difficult to find due to their diversity, isolation, special communication needs, and the amount of time and resources it requires. Registries are established in various states to identify and record the location, number, and needs of transit-dependent individuals in extreme events. However, these registries are not always successful due to privacy issues. Much of the key data are protected by federal privacy legislation, so it cannot be found by screening public records. Estimation of the number of potential evacuees is also complicated for the same reasons. In a later section of this report, the authors provide an example of estimating the number of transit-dependent individuals based on three datasets. Comparisons are made with the actual number of evacuees during previous hurricane events.

Communication

Communication is an important component of the evacuation process for hurricanes and other extreme events. Communication systems must perform before, during, and after extreme events, and they must be resilient and well established to avoid system failure. Information must be provided such as the evacuation declaration, pickup locations, and amount of individual belongings allowed on buses. In addition to disseminating information to the public, communication systems are needed to make effective information exchanges between emergency-management agencies, police, authorities, etc.

Communication with special-needs populations has complex requirements. Factors such as disability, isolation, or other special restriction sometimes make them unable to use regular communication systems. Therefore, warning systems that target the special-needs population can be provided. This report later discusses current practices and communication barriers in more detail.

Transportation

Transportation needs are considered in evacuation plans according to the number of self-evacuating individuals, transit-dependent evacuees, and medically fragile individuals. Transportation plans also depend on hurricane strength, which influences the number of evacuees and evacuation destinations. For example, hurricane categories 1 and 2 require evacuation from the primary areas of vulnerability and from mobile homes, but are typically short-distance evacuations.

Transit-dependent individuals typically do not have personal vehicles or the means to acquire them. Therefore, buses are required to transport them to shelters. Mutual-aid agreements signed between adjacent or nearby states or counties play a vital role in supplying services and resources like buses and drivers.

Sheltering

During major hurricane events, evacuees go to hotels, relatives' homes, or mass shelters. Shelters are prepared based on the estimated number of individuals that might use them. Shelters are usually prepared and activated based on the extent of evacuation and whether the evacuees move inside or outside the county. Schools are often used as shelters because they have large open spaces and can take large numbers of evacuees. However, shelters should not be susceptible to surge inundation, rain, flooding, or wind.

The location of emergency shelters designated for transit-dependent individuals should be well known by the public. They should be equipped with necessary resources such as food, water, first aid kits, and beds. On the other hand, medically fragile individuals, living at their homes under some kind of medical care, require a separate shelter that can provide similar medical supervision and treatment to what they were receiving prior to evacuation.

Shelter planning is important. It must be flexible because the size and time associated with a particular evacuation is unknown when the evacuation begins. Many requirements of the sheltering process and other special needs are known in general such as providing water and food in or out of shelters. But the shelter planning must be far more comprehensive than that. Fortunately, NGOs (non-governmental organizations) like the Red Cross, Salvation Army, and various church groups play important sheltering roles and are included in the communications network.

Sample Special Situations - Medical Needs, Pets

In evacuation planning at least two situations require special attention when planning for emergency evacuation. These are medically fragile individuals and pets.

Medically fragile individuals may live in nursing homes or other residential health-care facilities. Alabama law requires that medical facilities (including nursing homes) have plans in place to take care of their residents. Thus, nursing-home residents do not report to a shelter. But some medically fragile people may live at home under constant supervision. Disrupting this supervision or medical care may result in loss of life or further problems. Therefore, care should be taken from pick up and transportation to sheltering. Ambulances are sometimes needed to transport these individuals, and shelters equipped with appropriate meals and professional caregivers may be required. These individuals may require life-sustaining equipment for which loss of primary power or discharge of backup battery power could have devastating results.

Also, many elderly individuals live alone and have a loving bond with a faithful pet. Shelters for either transit-dependent individuals or medically fragile individuals typically do not allow pets except for service animals. Due to these reasons, many individuals are reluctant to leave their pets behind so they are unwilling to evacuate. Planning agencies often prepare evacuation plans for pets, and pet owners should take the necessary precautions for their pets, like proper vaccination, properly sized carriers, up-to-date identification collars, and placement of micro-chips.

Experience in Other States (Southeastern States)

During this study, attempts were made to contact individuals from emergency-management agencies in the southeastern states. Information was gathered on central challenges such as defining the transit-evacuation populations, estimating the number of transit-dependent individuals, ensuring better participation in the registry, staying in contact with vulnerable populations, and managing the evacuation. As an example of the procedures developed in other states, the standard operating procedure for evacuation of special-needs populations in Georgia Coastal areas is presented in Appendix C.

During the telephone calls associated with this project, it quickly becomes apparent the eight southern states that border the Gulf of Mexico and Atlantic Ocean have different definitions, assumptions, and procedures for virtually every aspect of transit evacuation. This is especially true for the definition of the “special-needs population” and for planning and conducting the evacuation. This is illustrated by a few examples.

- Texas
 - Based on recent evacuations, more assets are needed to move those who need help evacuating.
 - The Texas National Guard prepared the basic evacuation plan, starting from staging areas.
 - They have a thorough registry (dialing 211 connects potential evacuees to the registry).
 - They have a wide definition for “special-needs population.” It includes everyone with a medical problem.
 - In estimating evacuees, they take a “highball” percentage.
 - They stand ready to assist nursing homes and retirement homes.
- South Carolina
 - The state appointed a “special needs” task force to study the major issues and to determine which groups were evacuation candidates. They used census data to estimate the number of evacuees, and they developed assumptions such as special-needs individuals include only disabled individuals. They considered people with at least one disability, omitting those who had employment because they probably had a way to travel.
 - The special-medical-needs population, based on historical data, accounted for one quarter of one percent of the total population.
- Virginia
 - The definition of “special needs” is a big issue in Virginia. Every group is different, and they know of no clear definition of “special needs.” The Virginia Department of

- Public Health is trying to sort through all the associated issues to develop a baseline for special needs.
- In Virginia sheltering is a local issue. But once people start moving inland to dodge a big storm, there are no local sheltering plans. Florida has state legislation that requires a first-level sheltering policy, and Virginia would love to have similar legislation. About 1.5 to 2 years ago the Department of Social Services took over the sheltering plan, so Virginia is now developing a “state-assisted” sheltering plan. They surveyed, inspected, and inventoried state-owned facilities. They now have 18 facilities ready to serve as shelter and 25-30 facilities nearly ready. They will be staffed by the state when sheltering is needed.
- Georgia
 - The Georgia Emergency Management Agency (GEMA) defines the special-needs population as those who need transportation. Georgia has six coastal counties, in which they ran full-page newspaper ads and used other means to get into contact with the population desiring evacuation. They got a number of people for each county, but the numbers were small. Chatham County had about 200. Based on GEMA’s knowledge, they knew that was too small and doubled it. Every year they check the evacuation population and develop a fresh registry. They do a case-by-case review of each person.
 - Each county is different; starting with the level of resources (mostly they use school buses, but they use mass transit in Savannah). They put risk tags on the hands of all who evacuate on their buses, so they can track the evacuees. The Department of Public Safety has conversion kits for the buses (it “sort of” converts them into ambulances).
 - The Department of Human Resources identifies special needs shelters and the American Red Cross is looking at sheltering the segment of the population that needs assisted evacuation.
 - The evacuation timeline starts 24 hours ahead of the general-population evacuation. They have clearance times for evacuations in each county. Chatham takes 36 hours to clear unless Interstate 16 is reverse-laned; then it takes 22 hours.
 - The GEMA (2007) standard operating procedure, “State Assistance in Emergency Evacuation of Special-Needs Populations from Georgia Coastal Areas,” is simple and easy to use. It is provided included in Appendix C as an example plan.
 - Mississippi
 - The State Department of Health (DPH) handles the definition of the special-needs population.
 - The State Police, Department of Education, Emergency Management Agency, Department of Transportation, and DPH have various leadership roles in hurricane evacuation.

Transit-Dependent Population (Vulnerable Population)

Many states have developed evacuation plans for the general population that focus on self-evacuating individuals. The need to plan for the individuals who cannot self evacuate did not become clear until after Hurricane Katrina. At that point federal law changed to require planning agencies to include special-needs populations in their evacuation plans. However, lack of a nationally accepted definition for this population group has made the planning process more difficult. This is one of the most important but overlooked realities. It is not being addressed adequately by most states and local EMAs.

In planning for transit-dependent individuals, four main issues seem to surface. These are: (1) identifying potential evacuees, (2) locating them, (3) determining their needs, and (4) providing transportation for them. To identify these individuals, the first step is to define which population segment they represent. Different studies give different names and definitions for individuals who have special requirements during extreme events such as “special needs,” “careless,” and “transportation-disadvantaged.” However, the basic idea behind these names is to identify individuals who, for whatever reason, may need transportation or other resource assistance to evacuate during extreme events. There is no nationally mandated definition for this segment of the population; however, the *Comprehensive Preparedness Guide* (CPG) 301 of the Federal Emergency Management Agency (FEMA) and Department of Homeland Security (DHS) recommend the definition produced by the National Response Framework (NRF). The report states that applying this definition helps improve inter-governmental communication during an incident. The NRF provides a function-based approach to define the special-needs population as follows:

Populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to:

- *Maintaining independence*
- *Communication*
- *Transportation*
- *Supervision*
- *Medical care*

Individuals in need of additional response assistance may include those who have disabilities, live in institutionalized settings, are elderly, are children, are from diverse cultures, have limited English proficiency or are non-English speaking, or are transportation disadvantaged.

The NRF definition focuses on the following functional aspects:

- **Maintaining Independence** – Individuals requiring support to be independent in daily activities may lose this support during the

course of an emergency or a disaster. This support may include supplies (e.g. diapers, formula, catheters, and ostomy supplies), durable medical equipment (e.g. wheelchairs, walkers, and scooters), or attendants or caregivers. Supplying needed support to these individuals will enable them to maintain their pre-disaster level of independence.

- Communication – Individuals who have limitations that interfere with the receipt of and response to information will need that information provided in methods they can understand and use. They may not be able to hear verbal announcements, see directional signs, or understand how to get assistance because of hearing, vision, speech, cognitive, intellectual limitations, or limited English proficiency.
- Transportation – Individuals who cannot drive or who do not have a vehicle may require transportation support for successful evacuation. This support may include accessible vehicles (e.g. lift equipped or vehicles suitable for transporting individuals who use oxygen) or information about how and where to access mass transportation during an evacuation.
- Supervision – Before, during, and after an emergency, individuals may lose the support of caregivers, family, or friends or may be unable to cope in a new environment (particularly if they have dementia or psychiatric conditions such as schizophrenia or intense anxiety). If separated from their caregivers, young children may be unable to identify themselves and, when in danger, may lack the cognitive ability to assess the situation and react appropriately.
- Medical Care – Individuals who are not self-sufficient or who do not have adequate support from caregivers, family, or friends may need assistance with managing unstable, terminal, or contagious conditions that require observation and ongoing treatment; managing intravenous (IV) therapy, tube feeding, and vital signs; receiving dialysis, oxygen, and suction administration; managing wounds; and operating power-dependent equipment to sustain life. These individuals require the support of trained medical professionals.

The above examples illustrate function-based needs that may exist within the community (FEMA 2009).

Based on their transportation and sheltering requirements, individuals stated in the above NRF definition can be categorized into three groups. These are:

- Transit-dependent individuals – Individuals who can use transit service buses and school buses for transportation. The majority of them can enter general mass shelters that only provide basic services, but others, such as disabled individuals, may require shelters

equipped for their needs unless the general shelters are properly equipped. They include individuals stated under the transportation and communication component of the NRF definition.

- Medical-care-dependent individuals – these are individuals getting constant medical care at their homes from family members or professional caregivers. They have much more complex needs, for example: they require an ambulance for transportation and a separate shelter equipped with medical professionals, medicine, etc.
- Congregate or residential-care individuals – these are individuals living in a group setting under constant supervision or medical care. Congregate or residential facilities include nursing homes, adult and child care facilities, foster homes, etc. According to the FHWA study *Evacuating Populations with Special Needs*, these facilities are required to have emergency plans to receive Medicaid and Medicare funding and the proper licenses.

This report focuses on the first category: transit-dependent individuals. Medical-care-dependent individuals and congregate or residential-care individuals are not included. Estimation or identification of medical-care-dependent individuals requires data from routine transportation providers, health departments, social service settings, etc., plus registries, which are beyond the scope of this project.

Transit-dependent individuals may further be divided into two categories based on transportation needed to reach the staging area, from where they will board the transit buses. Staging areas should not be confused with “shelters” or “sheltering areas.” The categories are:

- Individuals who can reach the staging locations by themselves, including the following:
 - Individuals living within walking distance from the staging center.
 - Individuals who may want to use the transit service for reasons such as an inability to cover gas costs; vehicle unreliability for long-distance driving; inability to drive long distances due to age or disability; etc. Therefore, these individuals drive to the staging area, in which case preparing other parking areas outside the staging area may be an issue.
- Individuals who need transportation assistance to the staging areas. This can be achieved through the following ways:
 - Organizing churches or other volunteer organizations to transport them.
 - City buses or other designated buses could pick up individuals along established bus routes.

Characteristics of Transit-Dependent Individuals

As can be seen from the NRF definition, these individuals comprise a diversified group and in some cases are a large percentage of the population. Their characteristics and needs vary depending on age, disabilities, or both. Individuals without physical or cognitive limitations are easier to evacuate with buses because they require minimal assistance. On the other hand,

individuals with disabilities may not be able to perform activities such as walking, climbing, dressing, learning, or remembering. These conditions may impede them from using buses and general population shelters. It is also difficult to effectively communicate with them, e.g. transmit information such as pick-up locations, warnings, or evacuation orders.

Another important characteristic of these individuals is that there is overlap between disabilities, age, and poverty. Renne, Sanchez, and Litman (2008) indicated that individuals with severe disabilities are more likely to have low incomes, earning \$12,000 per year compared to \$25,000 for individuals without disabilities. As a result, “many low-income disabled people are more prone to living in areas that lack critical infrastructure and are at higher risk for an emergency. They face additional difficulties, such as lacking adequate housing, telephone and Internet service, automobile transportation, and credit cards.” In addition, Mobile County data from the 2000 Census indicate that 13% of the population are age 65 years and over, and half have some form of disability (US Census Bureau n.d.).

Summary of the State of Practice for Evacuating Special-Needs Populations

Special-needs individuals have a wide range of needs and comprise a large portion of the population. Evacuation plans need to consider all these individuals. However, defining, identifying, and locating these individuals requires a lot of work. There is no nationally mandated definition for special-needs individuals, but applying the NRF definition appears the logical recommendation because it helps improve inter-governmental communication during emergencies.

Contacts with southeastern states have shown that each state does evacuation planning for special-needs individuals differently because it has a different amount of resources, different definitions of special needs, and different risks. Therefore, not all states can have the same plan – the plan must be adjusted to each area’s specific conditions.

Section 3

Communication with the Special-Needs Population

Communication Needs

Communication is a basic need in any emergency response. To conduct a successful evacuation, effective communication is essential between local government officials, emergency-management agencies, emergency workers, and the community. These communications are important before, during, and after a major hurricane event.

Natural disasters create fear and anxiety, which may lead to extreme confusion and disorder without effective communication. Katrina and other major hurricanes have shown that many things can impede communication between emergency-management organizations and the community. For example, communication-equipment shortages, damage to the communication infrastructure, lack of interoperability between emergency responders' communication equipment, and similar problems may delay response and increase the loss of life (Meeds 2006). Communication failures may further impact special-needs individuals because most of them are socially isolated, have limited mobility, and lack access or ability to use different communication systems.

FHWA (2009) indicates that during Hurricane Katrina, inability to understand emergency communications played a role in the death and suffering of people with disabilities, the aging population, and people with medical conditions. Moreover, "some people with psychiatric disabilities had difficulty comprehending the evacuating messages and other essential communications and some were treated roughly because they could not follow the instructions." These and other disasters led to a need to strengthen transportation and communication issues in evacuation plans for special-needs populations (FHWA 2009).

Public Law 109-295, the "Department of Homeland Security Appropriations Act of 2007," requires the Federal Emergency Management Agency (FEMA) to ensure that information made available to individuals affected by an emergency or major disaster is made available in formats that can be understood by individuals with special needs. It also requires each state, local, or tribal government develop procedures to inform individuals with disabilities or other special needs of evacuation plans before and during an evacuation to the maximum extent practicable (TRB 2008).

Communication Challenges

Communication with special-needs individuals is usually hindered by physical, organizational, or social factors. To achieve effective communication, it is important to identify the challenges and

to implement alternative solutions. ASTHO (2008) identified various challenges in communicating with special-needs individuals. Some of these challenges follow:

- Lack of access to radio or television, internet, or a telephone.
- Lack of credible source of information. These individuals may not consider government officials to be a reliable source of information.
- Inability to travel to where the information is available.
- Materials may be scarce or may not be available in a format understandable by the special-needs individuals. For example, it may not be available in different languages, Braille, large print, or audio files.
- They may be geographically isolated or dispersed.

In addition to these challenges, there are communication challenges caused by hurricane events. For example, if a power outage occurs, electronics such as television, radio, and the internet will not work. This may lead to dependence on traditional landline telephones and wireless phones as long as the batteries are charged. Even then, all towers and switching stations may become clogged.

Measures to Minimize Communication Challenges

To reduce the impact of these challenges, it is essential to consider different measures. ASTHO (2008) suggests effective communication plans require three key components: audience-appropriate messages, trusted messengers, and effective methods. The study suggested the following about each component:

Audience-Appropriate Messages

- Messages must be customized to the needs of specific population.
- Messages must reflect the cultural realities of the intended audience.
- Messages need to be geared to low-level reading ability with simple, clear, and direct language.
- Messages should be brief and constantly re-evaluated.

Messengers

The acceptability of messages depends on the messengers conveying the message. These messengers could be media personalities, religious leaders, teachers, law-enforcement officers, etc. However, different population groups may trust messengers differently. For example, undocumented workers and immigrants are unlikely to rely on official sources, and African-American communities may not accept information from government officials because of the history of racism.

Methods

Effective communication methods that help serve special-needs populations are required before, during, and after a major hurricane event. These communication methods reach the special-needs population based on their availability and the ability of this population group to understand them. As mentioned in previous sections, special-needs populations include a diversified group of individuals that may lack access or ability to use regular communication channels. For example, the homeless and migrant workers may not have access to television or radio, and the deaf cannot use mass notification systems such as reverse 911.

To alleviate these kinds of problems, planners can study the strengths and weaknesses of the available technologies. These technologies may include general population technologies, television, radio, internet, telephones, etc., or technologies available to aid disabled individuals, such as the telecommunication device for the deaf (TDD), teletypewriters (TTY), and caption telephone (CapTel).

Communication Systems

Communication systems vary based on the type of service (day-to-day activity or emergency service only), the users (people with a disability or people without a disability), connection or notification systems (point-to-point or broadcast communications), and so on. The application and effectiveness of these communication systems for emergencies also varies based on the technology's capabilities and the availability and severity of the event.

FCC (2009) divides emergency communication systems into three main components:

- 911 telephone call processing and delivery through Public Safety Answering Points (PSAP) and call dispatch.
- The Emergency Alert System.
- Radio or broadcast or cable television station news and updates.

911 Emergency Calling

This system is generally the backbone of the emergency response system in the US. Emergency 911 calls help the public notify authorities of emergency situations and get help. Dialing 911 quickly connects to a PSAP dispatcher, who directs it to local emergency medical, fire, or law enforcement. Enhanced 911, or E911, is also being applied widely to automatically report the telephone number and location of 911 calls made from landline phones.

Another important element of the 911 system is Reverse 911, which automatically calls landline telephone numbers within the affected geographic area and notifies them of emergencies and protective actions.

According to ASTHO (2008), these communication systems are compatible with some devices that aid people with hearing and speech disabilities such as CapTel and TTY, whereas various other emergency-notification software is not compatible with video phones and sidekick pagers.

The Reverse 911 emergency notification system has limitations that hinder effective communication with the general population as well as the special-needs population. Some of them are:

- Most emergency-notification-system telephone databases contain only listed telephone numbers.
- They cannot reach individuals who do not use any communication services, like transient people; individuals with blocked numbers; Voice over Internet Protocol (VoIP); and cell phone users, unless they are registered.
- They may be impacted by loss of power, high call volumes resulting in busy connections, and hang ups.

Emergency Alert Systems (EAS)

The EAS is the national public warning system that uses TV and radio to warn the public of emergency situations. It requires cable-television, digital-broadcast, digital-audio-radio-service, and direct-broadcast-satellite providers to offer communication capabilities to local, state, and federal authorities to deliver emergency information.

In relation to alerting special-needs individuals, the FCC requires emergency information to be delivered in a format appropriate for their needs – for example, aural and visual alerts and messages in different languages. However, EAS lacks compatibility with technologies that provide information in an accessible format for disabled individuals. This leads to insufficient dissemination of emergency information outside the EAS network (FEMA 2008).

FEMA (2009) indicates that development of the Integrated Public Alert and Warning System (IPAWS) is underway. This system is believed to be the nation's next-generation infrastructure. It is an alert-and-warning network expanding on the traditional radio-and-television EAS by providing one message over more media to more people before, during, and after a disaster.

Radio and/or Broadcast or Cable Television Station News and Updates

This includes non-EAS alert broadcasts or broadcasts of emergency information that does not trigger the EAS. The FCC requires all broadcasters that provide these emergency information broadcasts to include formats comprehensible by persons with a disability. The FCC requires television broadcast stations to provide emergency information in the audio portion of programming in accessible formats for people with hearing disability through closed captioning, sign-language interpreters, or another method of visual presentation. Emergency information provided in the video portion of the programming must be accompanied with an aural format.

Other Communication Systems

Some communication systems reviewed in the following paragraphs are as important as the three major components of emergency communication identified by the FCC. Radio and television reach less than 40% of the population during the work day, and even fewer watch TV after midnight (FEMA 2009). At the same time, the use of the internet, cell phones, and residential phones is increasing. Therefore, applying these communication media may help reach more people.

Emergency Telephone Notification Systems (ETNS)

ETNS are required to have the ability to send scripted emergency messages to hard-of-hearing individuals through TTY/TDD devices. Furthermore, these must provide immediate feedback to the system administrator if the users did not receive the scripted message.

Most large metropolitan communities have installed these systems (NENA 2004). When it is integrated with a geographic information system, ETNS helps target specific communities in a particular geographic area. In addition, these systems require accurate databases and frequent updates to transmit emergency information to the public effectively. The data source is usually the regions' 911 database and local telephone service providers. Additional data are recommended to be collected for cell-phone users, unlisted-telephone users, and special-needs individuals.

It is recommended that ETNS be augmented by designated persons who contact pre-identified individuals to avoid problems such as users hearing only part of the message or not being able to understand the message. The pre-designated persons may help repeat or clarify the messages.

Phone Trees

Phone trees help disseminate emergency information to a wide audience with only a few phone calls. The setup starts with high-level emergency managers at the top of the tree; phone calls go down to smaller and smaller branches and leaves. In this process it is important to make sure that people on every branch have the necessary contact information, such as alternate phone numbers. This system helps minimize the number of staff members required to make phone calls; however, it may not be effective at night when the branches do not have emergency personnel at work (FEMA 2008).

Text Messaging

Text messaging as an emergency notification system is mounting with the advancement of technology. It is usually available to anyone in the community. It is a very useful tool for hard-of-hearing individuals who are "technology savvy," and comfortable with this mode of communication. In some communities the service includes individuals with limited proficiency. It is important to note that text messages can appear on multiple devices like pagers, personal

digital assistants, and computers. It has a disadvantage in that the service can be provided only for registered individuals (FEMA 2008).

Internet

The Internet is an important tool for emergency notification and dissemination of information before, during, and after emergency situations. Two widely applied internet tools are email and websites. Some of the advantages and disadvantages of the internet for emergency notification are that internet popularity is increasing and the usage rate is high. FEMA (2009) indicated that the Internet has a 62% usage rate, averaging 108 minutes per person per day. Despite this, many special-needs individuals are not among the users because most lack access or understanding of these tools.

Email transmissions are deliverable during heavy transmission periods even if they are slow. The recipient need not be available at the time of delivery. However, people may not check their emails or emergency information websites regularly enough to receive an emergency messages in time to react appropriately.

Websites can be used to provide information for special-needs individuals; however, the information should be provided in different languages, simple format, readable in a different range of vision, etc.

Door-To-Door Warning Systems

FEMA (2008) considers this warning system to be time consuming and difficult to implement; however, it is necessary under some conditions, such as informing the homeless, if there are no other means of communication with a specific population group, or when a power outage occurs. Some important points related to this system are:

- Emergency-management agencies may not have enough personnel to perform this type of warning.
- It is time consuming and may endanger emergency personnel.
- Neighborhood cultural diversities should be considered.

Public Education/Outreach Efforts

An important element of communication is public education, which makes citizens aware of the threat of hurricanes, means of evacuation, steps in evacuation, agencies and organizations that assist in evacuations, how to get help, contact information, the locations of shelters, and so on. This information is provided long before threats emerge, on an ongoing basis, to help prepare citizens for the eventual arrival of threatening hurricanes. This information is useful to all citizens, but it provides particular assistance and assurance to those who are physically or mentally fragile or otherwise unable to evacuate themselves.

One of the best public education programs is conducted by Miami, Florida, whose plan/handbook has been used as a model by many coastal cities. One of their tenets is that the message has to be repeated often, in multiple modes, to emphasize and refresh the message.

Medical, religious, and service organizations are an important element of public education. These groups deal with members of the population that will need transportation assistance during hurricanes. These groups usually know the names and addresses for special-needs individuals. The groups are trusted members of this population, and the messages they provide are more likely to be accepted and trusted. Additionally, these organizations are often key members of the evacuation plan, and it is important that they interact with evacuees prior to an evacuation event.

Summary of Communicating with Special-Needs Populations

There are many technologies that can help communicate emergency messages to the general population and to special-needs individuals. However, each system has strengths and limitations for specific population segments. Therefore, one system cannot cover all the population.

During emergency situations many things could go wrong to cripple communication systems. Depending only on the primary communication systems may endanger many lives. Planning a backup system and applying a combination of methods to meet the need of special-needs people is essential. In addition, it is essential to test the capabilities of communication systems with technologies that aid people with disabilities.

Section 4

Estimating the Transit-Dependent Population

Estimating the number of transit-dependent individuals during a hurricane event is an essential part of transit evacuation planning. Finding data sources for this portion of the population is difficult due to the diversity and isolation of individuals in this population, and the amount of time and money it requires. This section addressed two aspects of estimating the transit-dependent population of Mobile County, AL:

1. An estimate was prepared for the population of transit-dependent potential evacuees during a hurricane evacuation for Mobile County, AL, based on current methodologies, practices from other states, and information from individuals working on similar projects.
2. Given the number of potential evacuees, an estimate was obtained for the proportion that would use transit evacuation rather than other evacuation means or deciding to stay in place during the passage of the hurricane.

Others Seeking the Same Information

The authors' research documented that many organizations and individuals are searching for methodologies to estimate the number of transit-dependent individuals. Three examples indicate the levels at which this information was needed and sought during this project:

1. The UNC Charlotte Center for Transportation Policy Studies (CTPS), the North Carolina Emergency Management Division (NCEM), and the New Hanover County EMA are conducting a Transit Evacuation Planning Project for Wilmington, NC. The study is under the direction of Edd Hauser, Director of CTPS. Early in this project, both CTPS and NCEM identified the estimation of the number of evacuees as a major unknown and the key issue in evacuation planning.
2. Dr. Brian Wolshon, an Associate Professor at Louisiana State University and Chair of the Transportation Research Board Subcommittee on Emergency Evacuation (A3B01), is concerned with all preparedness and operational issues associated with evacuation for both natural and man-made threats. Dr. Wolshon is working on a national research project that will provide advance knowledge of evacuation, especially the estimation of the population that will evacuate.
3. Dr. John L. Renne is an Assistant Professor of Urban Planning and Transportation Studies at the University of New Orleans. He is a national expert on evacuation of the carless/special-needs population. He is also the principal investigator of a national study on carless and special-needs evacuation planning.

As part of finding ways to estimate transit-dependent evacuees in this project, contact was initiated with knowledgeable individuals (mentioned in the list of contacts in Appendix E) from agencies and organizations that deal with evacuation. Some of the responses were helpful even though none of the individuals contacted knew of a readily available document or method that provided a precise way to estimate this portion of the population. Three examples of helpful replies follow:

1. Mr. David Schneider, Federal Transit Administration, Office of Program Management, suggested that the best way to estimate the number of people that would need to evacuate using transit would be to use a methodology that combines census information (households without vehicles and number of persons aged 80 and above) with additional information from local service agencies such as public and service transportation providers.
2. Dr. John L. Renne, Assistant Professor of Urban Planning and Transportation Studies at the University of New Orleans, mentioned that he and Dr. Brian Wolshon from Louisiana State University are using TRANSIM to create a synthetic population for estimating carless and special-needs populations. They are using Census data (SF3 and PUMS data) and land-use data. He also suggested using local and regional surveys (including special-needs registries) and the National Household Travel Survey of 2001 (although it might not provide enough data at the local level).
3. Ms. Nancy Humphrey, Transportation Research Board Senior Staff Officer, said the size of the evacuating population in total and the subgroup using transit depends on the type of emergency (e.g. a no-notice event like the 9/11 terrorist attack versus an emergency like a hurricane that happens with greater frequency), its scale, the time it occurs (e.g. off-peak, on-peak, weekday, weekend), and other factors. She mentioned that baseline estimates can be developed using a voluntary special-needs registry and gathering information about customers of paratransit providers and clients of social-service agencies.

Estimation Methods from Southeastern States' Plans

In addition to the results of the phone calls and email communications presented in Section 2, the UA researchers reviewed two states' hurricane-evacuation plans. The review focused on the estimation of the transit-dependent population. Useful information about their estimation methods included the following:

1. The Texas Governor's Division of Emergency Management used the 2000 Census to find coastal households without vehicles. In addition, they used data from a survey of the disabled, elderly, and low-income populations in 78 Texas counties. The survey was conducted by the Office of Community Transportation Service. From these data they concluded that local emergency managers should target low-income and elderly populations to make sure all who need to evacuate have a means of transportation (Lindell, *et al.* 2002).

2. The North Carolina Coastal Region Evacuation and Sheltering Standard Operating Guide states that the estimated number of people requiring transportation assistance for a county-wide evacuation was provided by county officials (NCDEM 2007).

From this information and telephone calls to southeastern state EMA offices, it became clear that the states estimate the transit-dependent population differently.

Guidance on Estimating Transit-Dependent Evacuation Populations

There is no definitive national standard on how to estimate the transit-dependent population. However, more guidance documents are beginning to surface. For example, the Government Accountability Office (GAO) studied the challenges in evacuating the transportation-disadvantaged population and assessed the barriers that state and local officials face. This included issues like the state of preparedness of state and local officials for these challenges and barriers, steps they are taking to address the challenges and barriers, and federal efforts to provide evacuation assistance for people without vehicles. According to the GAO report, the transportation-disadvantaged population can include numerous categories of people without personal vehicles. The report also mentioned that data on the location of transportation-disadvantaged populations are not readily available (GAO 2006). Emergency-management agencies face a major challenge is assembling such data, given the following reasons (GAO 2006):

- These populations are diverse and constantly changing. That makes data collection time consuming and expensive, and it requires a lot of resources.
- Some of these data are located in databases of different organizations such as social-service providers, departments of motor vehicles, and public/private transportation providers. These data are not usually shared with emergency officials nor can they be shared due to federal privacy restrictions.

GAO (2006) did provide a list of measures underway by some state and local governments to address the challenges facing transportation-disadvantaged populations. The following measures are related to estimating and identifying this segment of the population:

- Conducting surveys and studies by collaborating with local universities and schools of public health.
- Collaborating with state and local entities, social-service organizations, community groups, etc.
- Working in partnership with academic institutions to map transportation-disadvantaged populations using tools such as Geographic Information Systems (GIS).

The GAO report was written at the request of Congress, and will likely be influential in future legislation and funding. However, it certainly is not the only recent authoritative document to provide guidance on estimating the target population. For example, important recommendations from two documents by FEMA and the Federal Highway Association (FHWA) are presented in the following paragraphs.

FEMA (2008) suggests that planners should make informed estimates of special-needs individuals by using multiple relevant sources such as the US Census, social-service listings, bureaus of motor vehicles, paratransit providers, health departments, utility providers, and job-access services. It also states that establishing relationships with different stakeholders such as state, territorial, tribal, or local EMAs and departments of aging, social services, health, education, and media help produce effective special-needs evacuation plans.

Similarly, FHWA (2009) recommends preparing a baseline using census data, social-service and home-healthcare agencies, and other supporting organizations. It also recommends applying specialized registries and GIS in preparing the general estimates. However, it accepts the limitations of registries, such as their expense and the reluctance of people to use them.

What Can Be Learned from Evacuation Experience

According to the literature, the percentage of residents that will evacuate during a hurricane threat will depend on factors such as the vulnerability of their location, how safe they feel their home will be during the storm, how much they believe what public officials are saying about the actual threat, and their prior experiences with hurricane landfalls in their vicinities. They have responded differently in different circumstances and at different times. For example, Hurricane Katrina was the most costly and one of the deadliest hurricanes in the history of the United States. Knabb (2005) indicated that 1.2 million people from southeastern Louisiana to Alabama were ordered to evacuate; however, it is unknown how many actually evacuated. Hurricane Rita was the fourth most intense Atlantic hurricane ever recorded, and it caused an estimated three million people to evacuate from the Texas coast (Litman 2006). These two storms brought unprecedented evacuations and escalated concern. The number that actually evacuated compared to the number predicted to evacuate is not known.

Prior to Katrina and Rita, the resident population along the Gulf Coast took hurricane warnings “in stride.” Their experiences told them that hurricane routes in the shallow Gulf of Mexico could change, sometimes often. They also knew that early predictions of the landfall location could be inaccurate. In August 2008, Hurricane Fay fueled this feeling when it made landfall at four different places in Florida, triggering hurricane or tropical storm warnings along the entire coast of Florida. After seemingly wandering haphazardly, it scooted westward along the panhandle, where it deteriorated to a tropical storm over the shallow Gulf water near the coast before turning inland and crossing over Alabama (Stewart 2009).

From experience with prior hurricanes, long-time coastal residents in Mobile learned to expect structural damage (sometimes costly), loss of utilities, and other inconveniences, but rarely anything more severe. In making evacuation decisions, this knowledge was balanced against the inconvenience and distaste of suddenly leaving home and fleeing to an unknown, costly location for an unknown length of time until the storm passed. To understand how Mobile residents have made evacuation decisions in the past, it is helpful to look at the pattern of evacuation participation in Mobile County for four major hurricane events over the past several years. The

storms' characteristics are briefly described in the following paragraphs, and they are summarized in Table 4-1.

During Hurricane Ivan, the strongest hurricane of the 2004 Atlantic hurricane season, evacuation was ordered for Mobile and Baldwin counties south of Interstate 10, including a third of the incorporated territory of the City of Mobile as well as several of its suburbs. However, only about 1,000 residents evacuated (Wikipedia 2008).

Hurricane Dennis made landfall on the Florida panhandle as a category 3 hurricane on the Saffir/Simpson Hurricane scale on July 10, 2005, before tracking over Alabama as a minimal hurricane (Wikipedia 2008). Residents in Mobile County and those south of I-10 in Baldwin County were ordered to evacuate, but the Mobile EMA estimated that only about 3,000 people participated in the evacuation.

At one time a category 5 storm, Hurricane Katrina dropped to 125 mph winds (category 3) when it made landfall near Buras-Triumph, LA, and again near the Louisiana/Mississippi border. Although Katrina made landfall well to the west, the Alabama and the Florida panhandle coasts were both affected by tropical-storm-force winds and storm surges varying from 12 to 16 feet. Sustained winds of 67 mph were recorded in Mobile (Wikipedia 2008). But during this severe hurricane there were less than 1,000 evacuees from Mobile County.

Hurricane Gustav was one of three to endanger the Alabama coast in 2008. It was a 150-mph, category 4 storm when it devastated the entire length of Cuba. After entering the Gulf of Mexico it dropped to a category 3 storm, but it was immense in size. The storm had so much energy that it traversed the entire Gulf in a little over a day, dropping to a category 2 storm as it made landfall on the Louisiana coast. Since it reached category 4 early, inflicted severe damage in Cuba, was huge, and traveled at high speed, the media issued repeated warnings. Evacuation was ordered when it traveled close to Mobile. Only about 300 people needed transportation help to evacuate.

Table 4-1 summarizes the number of evacuees during four recent major hurricane events in the Gulf Coast area. To place the storm threat into context, the table shows the distance from Mobile County to the landfall of each storm.

Table 4-1. Number of Mobile County evacuees in major Gulf coast hurricanes

Hurricane	Date	Landfall Category	Landfall Location	Landfall Miles from Mobile	Mobile County Evacuees
Ivan	16-Sep-04	3	Orange Beach	30	1000
Dennis	10-Jul-05	3	Pensacola	65	3000
Katrina	29-Aug-05	3	New Orleans	115	< 1000
Gustav	5-Aug-08	Strong 2	Louisiana	130	300

Hurricane Ivan caused extensive damage to the Gulf Coast, with a recovery period of almost two years. Hurricane Dennis destroyed the I-10 Bridge just west of Pensacola, caused severe damage elsewhere, and disrupted travel patterns in Alabama and Florida along the panhandle. By the

time Katrina entered the Gulf of Mexico, Mobile County citizens had fresh memories that underscored the severity of the threat. The passage of Hurricane Gustav “just offshore” in August, followed by Ike in September, gave Mobile County residents reason to embrace evacuation, but in general the population did not seem to respond in fear to these storms. The tracks of the four hurricanes – Ivan, Dennis, Katrina, and Gustav – are shown in Figure 4-1.

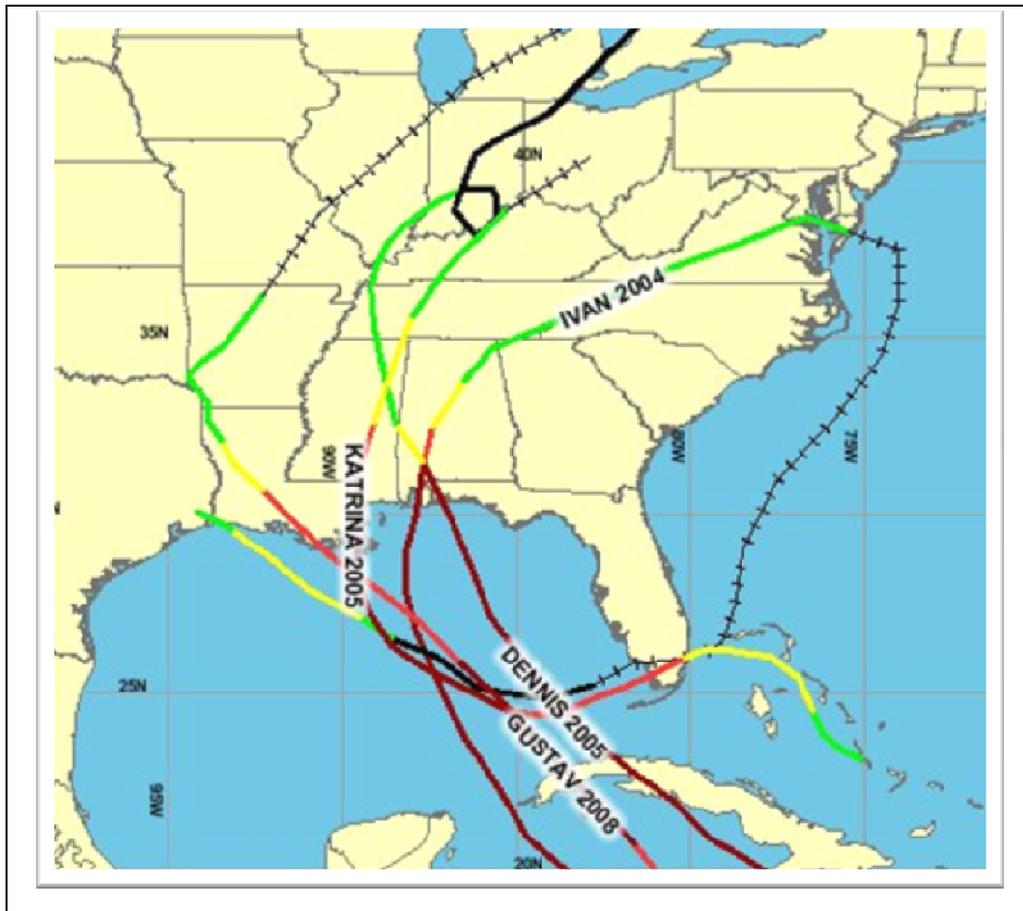


Figure 4-1. Hurricane tracks from NOAA Coastal Service Center (WKRK News 5)

Identifying and Estimating the Evacuating Population

An additional set of evacuation data was provided by Drs. Steve Meinhold of the University of North Carolina Wilmington and Dr. Billy Williams of North Carolina State. Their 2005 evacuation study included a survey of the attitudes of residents regarding the size storm for which responders would evacuate the Wilmington, NC, coastal area. Their survey results are contained in Table 4-2.

The North Carolina survey echoes the Alabama experience. It is especially interesting that the survey responses for a category 3 hurricane were later contradicted by the Hurricane Isabel experience. Only one-fourth of those who said they would evacuate actually did so. Apparently many (or most) people are reluctant to actually evacuate, even though they might have

previously thought that it was a good idea until they faced the actual evacuation decision. This adds a layer of complexity to evacuation planning.

Table 4-2. Evacuation Attitude Survey of North Carolina coastal residents

North Carolina Storm Class	% Population Indicating They Will Evacuate
Category 5	84%
Category 4	67%
Category 3	33%
Category 2	17%
Category 1	11%

Hurricane Isabel was weak category 3 storm for which 8% of the population evacuated.

Emergency-management planners attempt to provide transportation for those who need it, realizing that many eligible people might decline at the last moment. This requires estimating the maximum number who might accept evacuation in the face of an extremely large storm and planning for that number. But it wastes scarce funding to over-plan and gather resources for a huge evacuation event that never happens, when that funding could be put to use in actual disasters.

Estimate of Mobile County Transit-Evacuation Population

As mentioned previously in the paper, there are no readily available methodologies to establish the number of transit-dependent individuals during hurricane evacuation. In preparing estimates for MCEMA, UTCA researchers depended on the literature, census-based data sources, and the recommendations of topic experts. In each estimation method, the estimate was based on data for the number of households without vehicles and the number of persons aged 80 and above.

Census data on households without vehicles may underestimate the number of people who need evacuation assistance because it does not include tourists and commuters who are frequent users of public transportation. In addition, there are households comprised of older adults who may have a vehicle but use it only for short trips. They may not be comfortable using their personal vehicles for longer-distance evacuations in emergency situations. Even though there might be some overlap between households without vehicles and people over 80, the overlap might be a reasonable way to minimize the effect of underestimation when determining evacuees.

First Estimate – 2000 Census Data Source

Based on the 2000 Census data, the number of households without a vehicle is 13,410, or 8.9% of the total households for Mobile County. Using an average household size of 2.61 (taken from the Census), there are about 35,000 people without a vehicle. However, 2.61 people per household may be too high because many older citizens live in either one- or two-person households. In developing an estimate, UTCA researchers estimated that half the 13,410

households without vehicles are occupied by one or two persons, and the other half are on average occupied by 2.61 persons.

$$\begin{array}{rcl} (6,705 \text{ households}) \times (\text{avg. } 1.5 \text{ persons/household}) & = & 10,057 \\ (6,705 \text{ households}) \times (\text{avg. } 2.61 \text{ persons/household}) & = & \underline{17,500} \\ \text{Estimated total persons without vehicle} & = & 27,557 \end{array}$$

According to the 2000 Census, about 11,665 people, or 2.9% of the total Mobile County population, are above age 80.

Adding the estimates for those without vehicles and those above age 80 or above yields an estimate of 39,222 individuals who need transportation assistance during extreme coastal events. All indications are that this is a conservative estimate.

Second Estimate – 2006 American Community Survey Data Source

The American Community Survey (ACS) is conducted by the US Census Bureau in every county, American Indian and Alaska Native area, and the Hawaiian homeland. It is conducted using mail, telephone, and personal visits to sample addresses. The ACS is a nationwide survey designed to provide communities a fresh look each year at how they are changing. It is a critical element in the Census Bureau's re-engineered decennial census program. The ACS collects and produces population and housing information every year instead of every 10 years.

In 2005, the ACS expanded its sample to housing units in all counties in the 50 states and the District of Columbia and to all 78 municipalities in Puerto Rico. About three million housing unit addresses are sampled annually throughout the United States and Puerto Rico. In 2006, the ACS sample was expanded to include the population living in group quarters. Group quarters include nursing homes, correctional facilities, military barracks, and college/university housing among others. Because the data is sample based, they are subject to sampling variability for which the degree of uncertainty is represented through the use of a margin of error.

Survey data were extended to provide the number of households without vehicles. Then a 90% confidence interval was created using the standard error. These calculations are shown in Tables 4-3 and 4-4.

Combining the estimates from the tables, the total population that will need transportation assistance is somewhere from 21,685 to 37,859 people and the most likely number is $(16,834 + 12,908) = 29,742$ people. The reader should recognize that this represents an extreme estimate (max possible desiring evacuation) based on the extreme event (max hurricane possible).

Table 4-3. Mobile County households with no vehicle*

People Per Household	Households	People	Margin of Error	90% probability error range	
				Min	Max
1 Person	5,731	5,731	1,055	4,676	6,786
2 Persons	1,951	3,902	1,200	2,702	5,102
3 Persons	651	1,953	1,005	948	2,958
4 or more Persons	1,312	5,248	2,380	2,868	7,628 or more
Total with no vehicle	9,645	16,834	5,640	11,194	22,474 or more

*2006 American community survey data

Table 4-4. People 80 years or older

Age		Total People	Margin of Error	90% probability range	
				Min	Max
Male	80 to 84	2,290	499	1,791	2,789
	85 & above	1,474	467	1,007	1,941
Female	80 to 84	4,824	759	4,065	5,583
	85 & above	4,320	752	3,568	5,072
Total		12,908	2,477	10,431	15,385

*2006 American community survey data

Third Estimate – Harvard Telephone Survey Data Source

For three years, the Harvard School of Public Health has conducted a telephone survey of southeastern states to determine the public’s attitudes and perceptions about emergency evacuation in the event of a hurricane. The 2007 survey was conducted for Harvard via telephone by ICR, an independent research company. Approximately 5000 interviews were conducted from June 18 to July 10, 2007, in eight southeastern states. This included a representative sample of 503 respondents age 18 and older from Mobile and Baldwin Counties who lived within 20 miles of the Gulf of Mexico. The margin of error for the Harvard Survey was +/-5.0 percentage points at the 95% confidence level (Blendon, *et al.* 2007).

The Survey reported that 70% of the Alabama respondents might/would leave the area if evacuation were ordered. Of the total population, 9% would need help in evacuating but did not have such help “lined up.” Table 4-5 was prepared using the telephone responses of those “without help lined up,” and the 2007 population estimate based on the 2000 Census.

Table 4-5. People who would need help evacuating from Mobile County

Population of Mobile County	People having no help lined up	Margin of Error	95% confidence level	
			Min	Max
404,406	36,397	1,820	34,577	38,217

The table does not reflect individuals who replied that they would stay if an evacuation order were issued (30% of the total). Their reasons for staying varied and included statements like: (1)

don't know where to go, (2) don't have a car or know anyone who could give me a ride, and (3) have a medical problem that would make it difficult to leave. These are personal-inconvenience answers that might change in the face of a major hurricane. That means the values in Table 4-5 should not be interpreted as absolute but as a guide to the approximate maximum number that might desire evacuation assistance in a maximum hurricane.

Comparison of the Estimates

The three estimates in the previous sections show that a large number of individuals might need assistance during major hurricane events. The first and second estimate applied to households without vehicles and people above age 80 from the 2000 Census and 2006 American Community Survey respectively. The first estimate was 39,222 individuals who need transportation assistance, and the second estimate was 29,742 individuals. The third estimate, a Harvard Telephone Survey, gave an intermediate result of 36,397 individuals. Based on the three estimates, the average number of evacuees who need transportation assistance was estimated to be approximately 34,500, or 8.6% of the population.

As mentioned previously, evacuation orders were given for the four major hurricanes (Ivan, Dennis, Katrina, and Gustav) along the Gulf coast. The total number of transit-dependent individuals that might want to evacuate varies, depending on which zones must evacuate and the number of people in those zones. Table 4-6 shows the percentage of transit-dependent individuals that evacuated compared to the total population in zones ordered to evacuate. This percentage is based on the assumption that the percentage of transit-dependent persons in each zone matches the percentage of the transit-dependent populations in the general population. The populations in each zone are presented in Appendix B, Figure B-3.

Table 4-6. Comparison between actual and estimated transit-dependent evacuees

Hurricane	Landfall Category	Landfall Miles from Mobile	Actual Transit Dependent Evacuees	Potential Transit-dependent Evacuees based on evacuation order zone	Percent Evacuated
Ivan	3	30	1000	4815	20.8
Dennis	3	65	3000	34500	8.7
Katrina	3	115	1000	4815	20.8
Gustav	Strong 2	130	300	4815	6.2
Average			1325	12236	10.8

As can be seen from Table 4-6, during Hurricanes Ivan and Katrina, 20.8% of the potential transit-dependent populations were evacuated. However, during Hurricanes Dennis and Gustav a smaller percentage of the transit-dependent populations, 8.7% and 6.2% respectively, evacuated. On average only 10.8% of the potential transit-dependent population evacuated during the four major hurricanes.

In general, the average estimated number of transit-dependent individuals (12,236) seems arbitrarily higher than the average actual number of transit-dependent evacuees (1,325) during Hurricanes Ivan, Dennis, Katrina, and Gustav. Table 4-6 also indicates that the maximum

number of transit-dependent individuals actually evacuated is 3,000 during several category 3 hurricanes, including some that were category 4 or 5 before losing energy as they approached landfall in the shallow Gulf Coast waters.

Summary of Estimating the Transit-Dependent Population in Mobile County

The national literature did not provide a concise methodology for calculating the desired population. Instead it contained discussions of the potential types of persons to be evacuated and suggested reliance on census data supplemented by data from transit systems, churches, health organizations, and others. The same general types of guidance were found in a number of sources. For this project the guidance of a GAO (2006) report in conjunction with information in recent FEMA and FHWA reports was adopted.

When guidance from the literature was applied to Mobile County, it yielded a range of about 21,000 to 40,000 evacuees during the most extreme event. This range seems very large and arbitrarily high, especially in light of the actual number of evacuees during major hurricanes in recent years. There were never more than 3,000 evacuees during several category 3 hurricanes, including some that were category 4 or 5 before losing energy as they approached the shallow Gulf Coast waters at landfall.

To provide some balance to the above statements, one must acknowledge that many people indicate pre-event that they would evacuate if conditions and information available indicate that evacuation is a smart action to take, especially if an evacuation order is issued. One must also recognize that when it comes time to make the “go/no-go” decision, fewer actually evacuate than indicate they would. In rare events such as Katrina and the City of New Orleans, however, one must keep in mind that approximately 25,000 people were stranded at the Super Dome and 20,000 or so people were stranded at the Convention Center for several days after the storm hit. As has been observed by many researchers and emergency planners, “things that have never happened before happen all the time.”

Section 5

Mobile Case Study Conclusions

In this report the major issues of transit evacuation planning were discussed. These are the state of practice of transit evacuation planning; estimating the number of transit-dependent individuals; and communicating with them before, during, and after a major hurricane event.

In relation to the state of practice the authors considered the experiences of other southeastern states, including Texas, South Carolina, Virginia, Georgia, and Mississippi. The results from phone calls and email correspondence with these states showed that each state had its own way of defining, estimating the number of, and planning for transit-dependent individuals. This can be attributed to the different levels of risk and amounts of resources that the states have. Therefore it can be concluded that not all states can have the same plan – the plan must be adjusted to each area's specific conditions.

The many definitions of transit-dependent individuals show the diversity of these individuals. There is no nationally mandated definition for transit-dependent individuals, and various studies use different names and definitions for this portion of the population. The FEMA and DHS recommendation, the function-based NRF definition, was adopted for this report.

Some important issues were identified for communication with the special-needs population during emergency situations. Communication needs were discussed based on lessons from Hurricane Katrina and other major hurricanes from a legislative aspect. The communication challenges that hinder the fulfillment of the needs were identified, and measures to reduce their effect were suggested based on the literature review.

Communication technologies that help deliver information to special-needs populations during emergency situations were identified based on FCC website and other relevant studies. However, each communication system has strengths and weaknesses toward a specific population segment, so a single communication system cannot cover all special-needs populations. Therefore, multiple methods of communication are recommended to alleviate this problem.

Communication plans should include three key components: (1) audience-appropriate messages depending on age, literacy, cultural variety, etc.; (2) trusted messengers such as media personalities, religious leaders, teachers, or law-enforcement officers; and (3) effective communication methods based on their availability and the ability of special-needs populations.

The authors attempted to determine how to estimate the size of transit-dependent populations by consulting knowledgeable individuals from different agencies, contacting southeastern state

EMAs through phone calls and emails, reviewing EMA plans, and reviewing guidance documents from different organizations. In general, the current recommended practice for estimating the size of the vulnerable population is to use census data and to combine households without vehicles and the number of persons aged 80 and above. This can be supplemented by local and regional surveys including special-needs registries.

Based on these suggestions and a literature review, three estimates were produced indicating that a large number of individuals need assistance during a major hurricane event. The estimates yielded a range of about 21,000 to 40,000 evacuees during the most extreme event. To get these results, three estimates were made based on data from the 2000 Census, 2006 American Community Survey, and 2007 Harvard Telephone Survey. This produced estimates of individuals who need transportation assistance of 39,222; 29,742; and 36,397 respectively. Based on the three estimates, the average number of evacuees who need transportation assistance is estimated near 34,500.

This result was compared with the actual number of evacuees during major Gulf Coast Hurricanes Ivan, Dennis, Katrina, and Gustav. There was a huge discrepancy between the estimate and the actual evacuees. Despite the fact that these hurricanes caused huge damage near Mobile and evacuation orders were in place, the number of people who actually evacuated was never more than 3,000. However, the authors believe that it is always good to be prepared for the worst conditions.

In general, the report answers who special-needs people can be; what their characteristics are; how their number can be estimated; and how they can be reached before, during, and after a major hurricane event. The report is built on different guidebooks, studies, interviews, and email correspondence with knowledgeable individuals. It is the authors' intention that the ideas presented on definition and communication as well as the estimates be used as a base in planning for special-needs-population evacuation planning in Mobile, AL.

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Part II

Wilmington, NC, Case Study

Section 7

Case Study for Wilmington and New Hanover County, NC

Introduction

Beginning in January 2008, the Center for Transportation Policy Studies at the University of North Carolina Charlotte entered into a research agreement with the University Transportation Center for Alabama (UTCA) to study the ways that transportation planners, engineers, and emergency-management agencies could improve the emergency evacuation of individuals who lack personal vehicles or the means to acquire them during extreme coastal events. Obviously, this would focus on the use of transit vehicles and agencies managing them to be prepared to use them for evacuating the transportation disadvantaged. The challenge for this study was to explore all available resources that would help create a system that would identify and locate transportation-disadvantaged residents and visitors and match that demand with a supply of transportation services (Figure 7-1). While the emphasis of the Mobile case study was on the overall number of people that might evacuate, the Wilmington case study focused on the likely location from which transit-dependent populations might be evacuated.

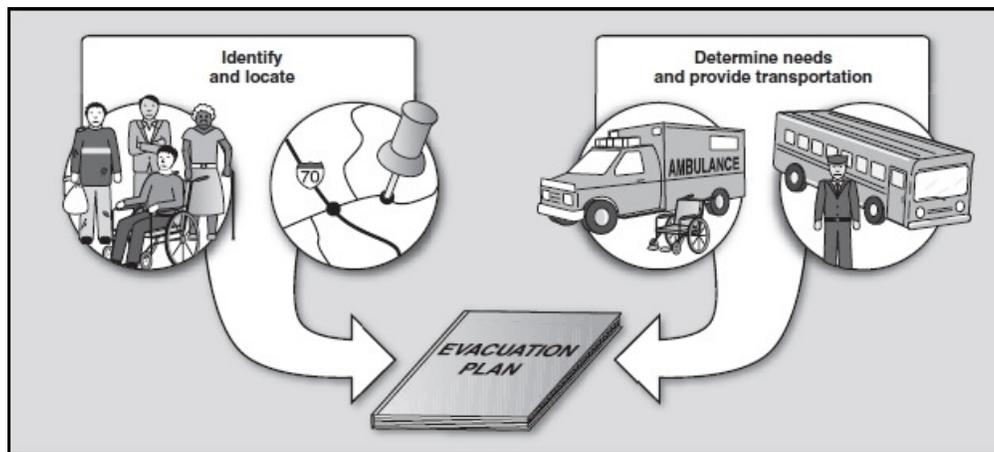


Figure 7-1. Challenges in evacuating transportation-disadvantaged populations (GAO 2006b)

Mobile County, AL; Wilmington, NC; and New Hanover County, NC, were chosen as simultaneous case-study locations. The objective of the study was to develop and provide background information for an addendum to each area's emergency-evacuation plans. Issues to be studied included procedures for pre-identification of the target population, communication, coordination, collection of evacuees, staging areas, medical attention, efficient passenger loading, optimum use of buses, specific bus fleets available, and similar issues.

This study directly supports transportation and asset management as a priority research theme. It is based on the Federal Transit Administration's 2007 updates to its critical research needs, as

contained in the FTA *Strategic Research Plan*. This section presents the findings and recommendations for the Wilmington/New Hanover area on the coast of southeastern North Carolina. Over the past 18 months, the study has involved three on-site visits with city, regional, state, and federal management authorities, and in part has involved various tasks such as identifying appropriate volunteer agencies or groups for involvement in communication to and support of the evacuees as the process is initiated and conducted.

Data Synopsis for the City of Wilmington and New Hanover County, NC, that Affects Hurricane Evacuations

New Hanover County, at 198 square miles, is one of the smallest counties in the state land-wise; its population is currently about 180,000 residents. Seasonally, the beaches of New Hanover County (Wrightsville, Kure, and Carolina) draw a tremendous number of tourists on a weekly basis, raising the population to over 200,000. The city of Wilmington is the largest city on the North Carolina coast. Much of the data related in this study are from a 2004 study by Kimley-Horn and Associates for WAVE Transit, the public bus system for Wilmington and some parts of the county.

In 2004, there were estimated to be 45,000 households in Wilmington with an average size of 2.1 people. The county of New Hanover had 82,000 households with an average size of 2.2 people. Areas in the county that hold a larger number of minority residences are shown in Figure 7-2.

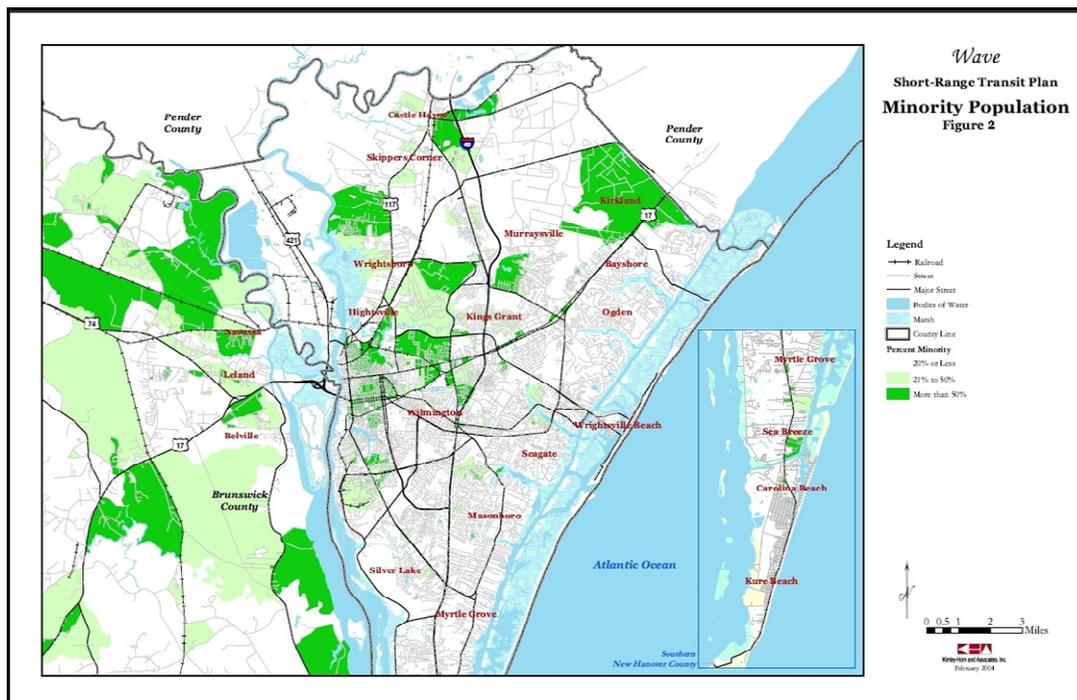


Figure 7-2. Residence locations of minority populations, New Hanover County

Potential Language Barriers

Among people at least five years old living in Wilmington, 7% spoke a language other than English at home. The average for the county was 6%. Of those speaking a language other than English at home, 63% (county 58%) spoke Spanish and 37% (county 42%) spoke some other language. Thirty-nine percent (county 38%) reported that they did not speak English “very well.” When the EOC is activated, both Public Health and Department of Social Services have interpreters present to take calls from non-English speaking residents.

People with Disabilities

Among people at five years old and older in Wilmington, 17% (county 15%) reported a disability. The likelihood of having a disability varied by age – from 7% of people 5 to 15 years, and 14% (county 12%) of people 16 to 64 years old to 40% (county 38%) of those 65 and older.

Poverty and Participation in Government Programs

Nineteen percent (county 13%) of people were in poverty; 24% (county 17%) of related children under 18 were below the poverty level compared to 9% (county 7%) of people 65 years old and over.

Vehicle Availability

Eleven percent (county 7%) did not have access to a car, truck, or van for private use. Using 2000 US Census Bureau data, this translates to over 4,000 people in Wilmington (county: over 5,900) without personal transportation. Figure 7-3 shows automobile (personal-vehicle) availability by areas within the city of Wilmington and New Hanover County. This information begins to identify the areas that potentially would need special attention and transportation out of the area in the event of a hurricane.

Nationwide, in 2007, about 9% of households did not have a vehicle in the household. The proportion of households without any vehicle has continued to decline. Between 2000 and 2007, the proportion declined another 0.5 to 1.0 percentage points, given the change in survey methods in the American Commuter Survey (ACS) and the decennial census “long form.” African-American and Hispanic households are still more likely to be without a vehicle than White, non-Hispanic households, but the gap is closing (FHWA 2009).

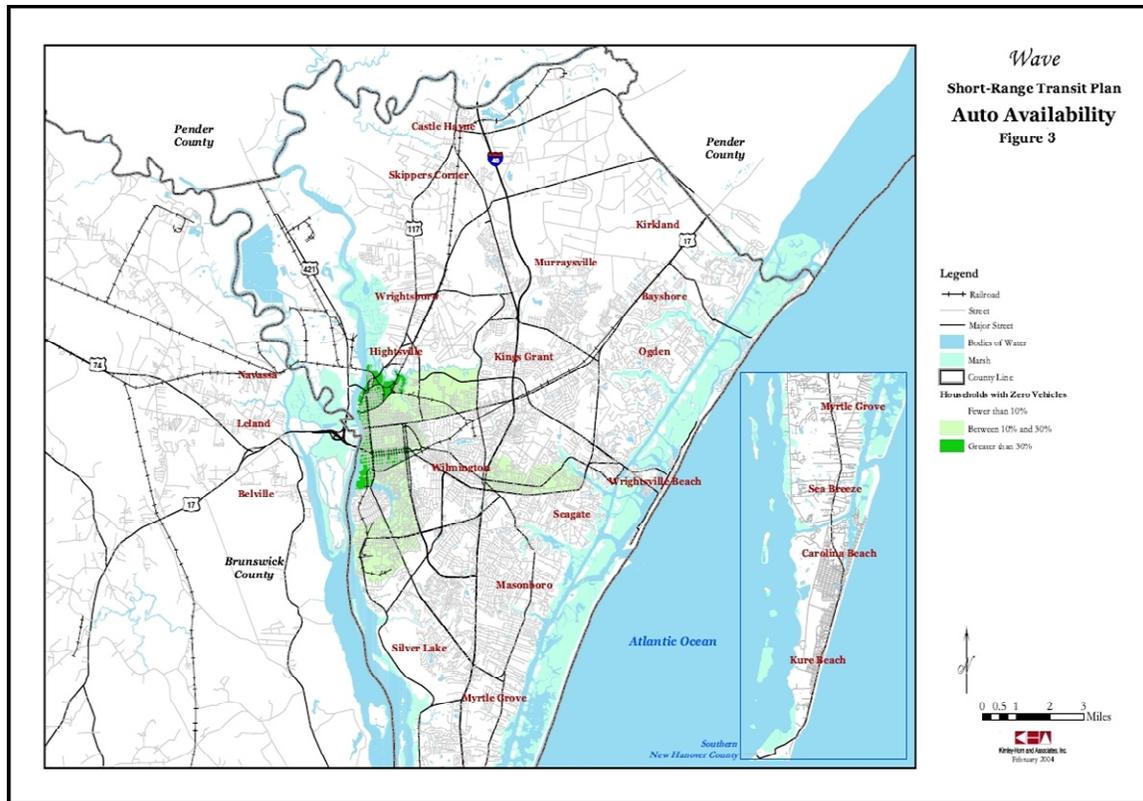


Figure 7-3. Residence locations of HH with low rate of auto availability in New Hanover County

Arrangements Made to Date for Accommodating the Special-Needs Population

A high degree of coordination and communication already exists among the various agencies that have responsibilities related to hurricane evacuation in Wilmington and New Hanover, led by the Director of the County's Office of Emergency Management, Mr. Warren Lee. This office has a full-time Emergency Management Specialist, Kristen Wingenroth, who also coordinates with a wide range of agencies in the area, including WAVE Transit, the state and city DOTs, County Health, Social Service, and Senior Citizens Departments, Red Cross and other NGOs, and the Emergency Management Manager at UNC Wilmington. (State universities throughout the state are beginning to put in place either full-time or part-time emergency managers, who recognize and generate the synergy involved that connects these educational institutions (as well as community colleges) with the counties. Other specific actions that relate to the transportation disadvantaged and hurricane evacuation HH are discussed in the following pages.

Special Needs Task Force

As part of its emergency evacuation planning process, New Hanover County has created a Special Needs Task Force. It is composed of health and adult service agencies, both responsible agencies, and NGOs (non-government agencies) to plan for disasters. It also recruits volunteers in advance of disasters to evaluate resources and services that may be available for individuals who may need more help due to physical or medical limitations. The Task Force meets every

four to six weeks (since 1997) to develop plans and try to anticipate and eliminate problems that may occur. These plans usually fall into three categories; education, evacuation, and sheltering. Many issues have been addressed since 1997 using a unified approach to remove obstacles that threaten the safety of individuals with functional needs during a disaster. Regular meetings have benefited the group by creating awareness of resources within each agency that may be of use by other participating agencies during an event.

Special-Needs Registry

New Hanover County maintains a Registry of Individuals with Special Needs through the Department of Aging (see Figures 7-4 and 7-5.) This registry is used in the event of disaster and to coordinate care for individuals including transportation. It also makes the determination for referral to IC3 (Individual Care Coordination Center). The Registry is a computer list generated by data provided by individuals or their representatives. Registry participation is voluntary.

[The] homeless population needs to be addressed by one of the agencies that supply services on a regular basis. The Registry cannot identify the homeless as they lack telephone numbers and addresses (Wingenroth 2008).

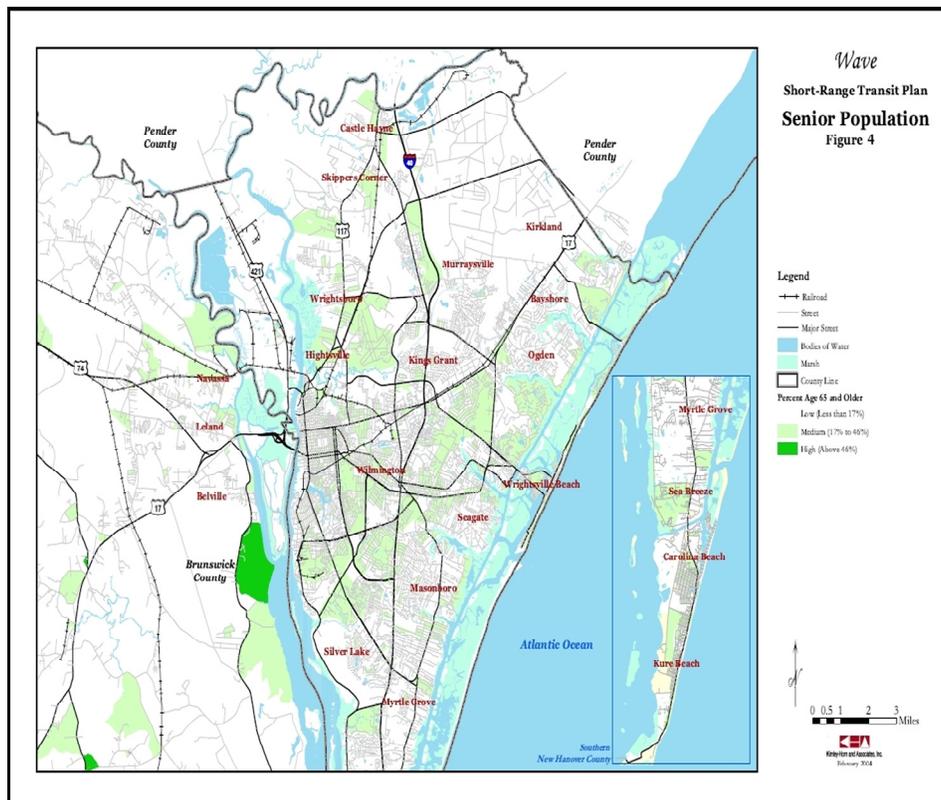


Figure 7-4. Distribution of senior citizens in New Hanover County

No matter how comprehensive a registry may be, not all people with disabilities will register. Some people may not wish to identify as having a disability. Others may not view their disability as creating a special need and others may not think to register until after they feel the impact of a disaster. And some, despite the most concerted outreach efforts, may not be aware of the registry. The registry should be considered only as a guide in an emergency, and not as a definitive or exhaustive list (NOD n.d.).

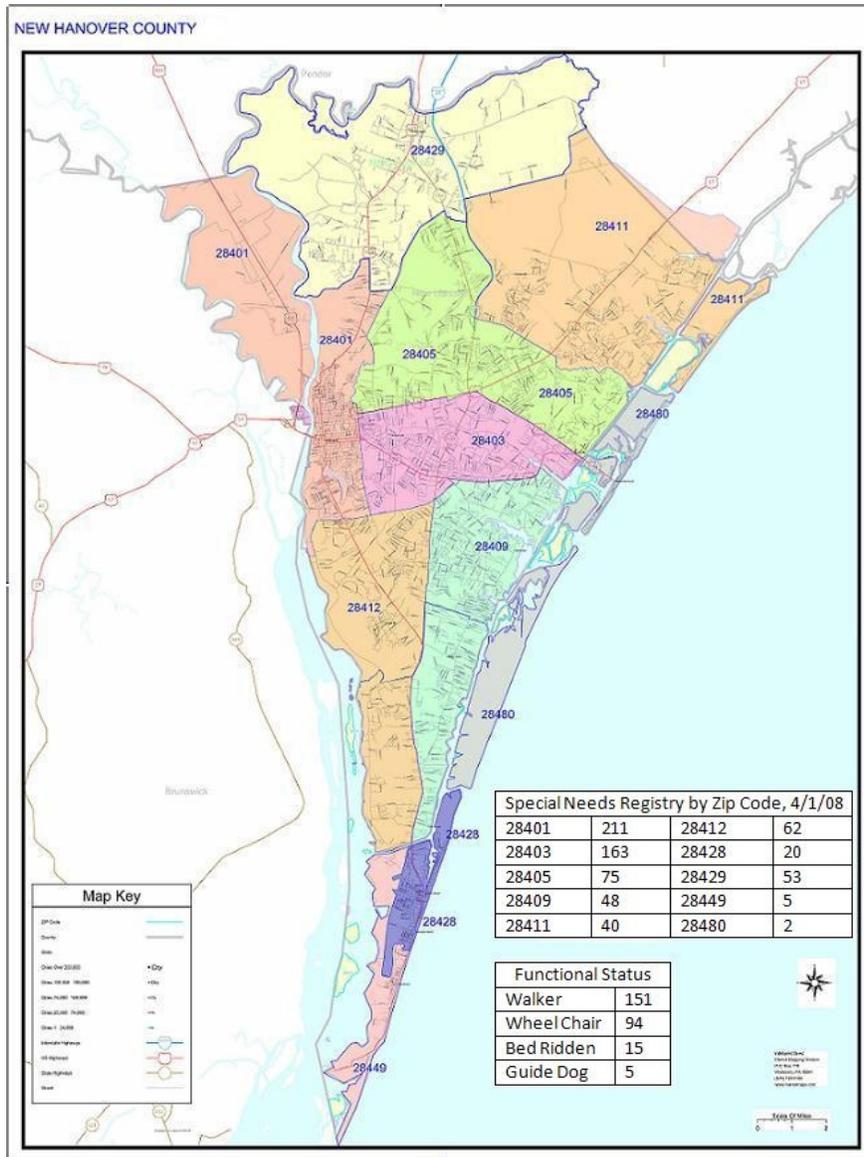


Figure 7-5. New Hanover County special-needs registry by zip code

Special-Needs Directory

The New Hanover County Department of Social Services works closely with the Department of Aging. It maintains a special-needs directory of all individuals who apply to social services. Based on their internal studies of “special needs” and the supplies and equipment needed to outfit a “Special Needs Shelter” it was determined that a method of triage based on individual needs is the most efficient method of caring for those individuals at risk. In the event of an approaching hurricane, the Department of Aging engages RSVP (Retired and Senior Volunteer Program) volunteers, who have been trained to make calls to individuals in the directory and verify their previously accepted plan. The plan may be to shelter in place or to have a friend or relative transport them to a safe area. If the individual has a special medical need such as oxygen, he will be encouraged to order an extra tank or to have additional supplies of needed medication.

However, special-needs registry forms became confusing with notes from the IC3 overlapping pre-event call-down documentation. The Call-Down Team that does the pre-event calls is composed of senior volunteers with no medical or health-services background. Their job is a “simple triage – do you need help? Do you want someone to call you if possible during an event?” (Wingenroth 2008)

Currently there are some 26,000 residents enrolled in the New Hanover County Medicaid program and 17,000 on the food-stamp program among 180,000 permanent residents. The Social Service Department currently serves 50,000 client cases annually. That number is considered by Department staff as likely to grow in the current economic downturn. Out of the approximately 700 residents who are registered through the Special Needs Directory, there are some 265 who require mobility assistance. Those include 94 registrants needing a wheelchair to be moved, 151 who require assistance with a walker, 15 who are bed ridden and require total assistance to be mobilized, and 5 who require use of a guide dog. The New Hanover Department of Social Services notes that the specific number of special needs clients changes almost on a daily basis (see Figure 7-6.)

Senior Center

The Department of Aging operates a Senior Center as an activity hub open daily until 5:00 p.m. Seniors come there for activities and meals. It is not a residence center. The Senior Center coordinates transportation for the elderly and the medically fragile population through contracted services with WAVE Transit for vans (30-40) and five taxi cab companies. These services are primarily used for day-to-day activities and medical appointments.

State Department of Transportation and State Highway Patrol

There are a number of challenges faced when attempting to provide a safe and efficient means of egress during a mass evacuation. Typically at North Carolina beaches – located on off-shore

Barrier Islands -- there is one way on and off the beach areas making early evacuation order for the beach areas an important consideration (see Figure 7-7). Wrightsville Beach maintains roadway access via a two-lane bridge on US 74-76, and Carolina and Kure beaches are connected to the mainland via Snow's Cut Bridge on US 421. The NC Highway Patrol closes bridges when wind speeds exceed 45 mph. The I-40 Lane Reversal Hurricane-evacuation plan has been widely disseminated by NCDOT resulting in a high level of awareness. To date, the plan has not been activated.

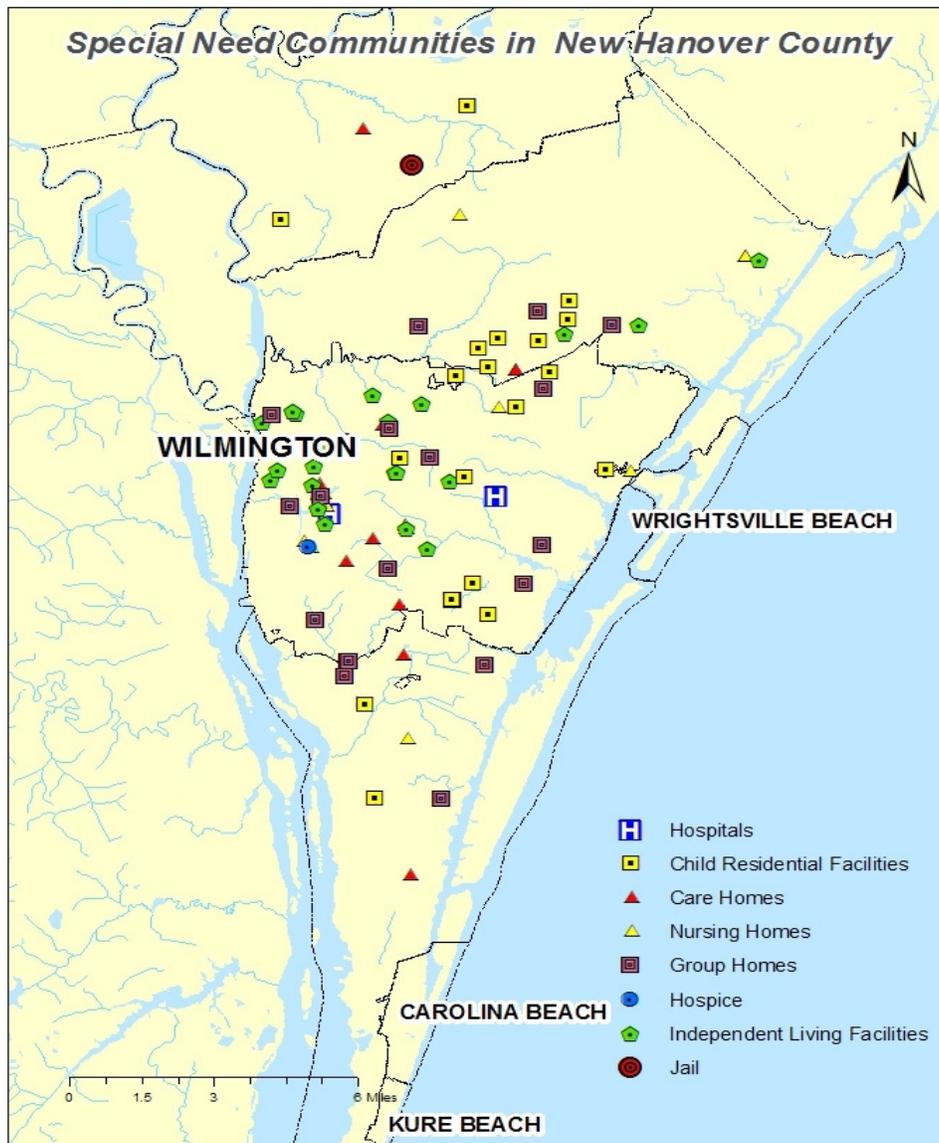


Figure 7-6. Special-needs communities in New Hanover County (Cavdaroglu and Gorter 2009)

The Interstate-40 Lane Reversal Traffic Analysis referenced in the previous section was conducted in 2006 (Tagliafferri, *et al.* 2006). Part of this report includes results of a survey to determine the anticipated evacuation behavior and in particular the anticipated evacuation routes. A total of 823 households were interviewed, revealing the following: 78% would evacuate to

another county vs. 22% staying in New Hanover; 58% would use I-40W for evacuation; 26% would use US Highway 74-76W; and the remainder would use Highway 421N, 17N, or some other lower-capacity route.

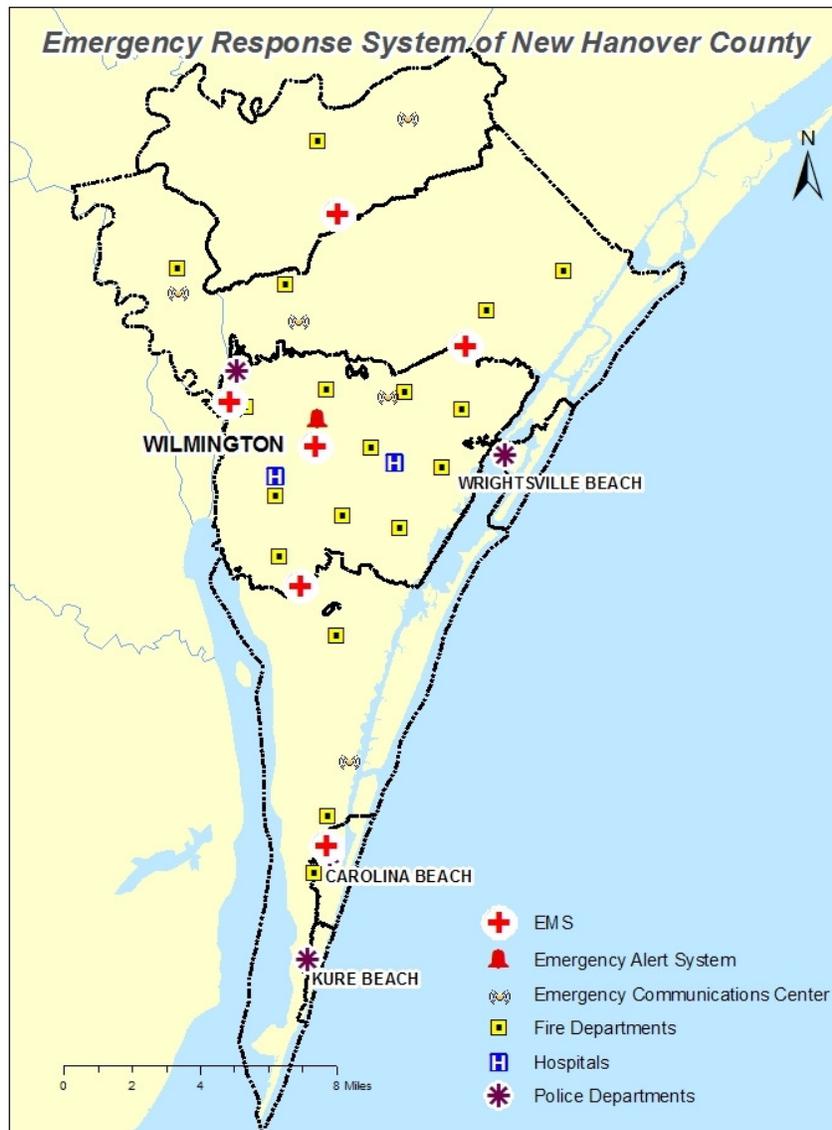


Figure 7-7. Emergency response system of New Hanover County (Cavdaroglu and Gorter 2009)

WAVE Transit System

Further plans for using buses for emergency evacuation are underway and were tested during an emergency evacuation drill on June 23, 2009. The need for specific transportation services as identified in this exercise was for charter buses to transport those individuals on the county’s registration list to shelters or to a nursing home certified as a shelter, with available beds. WAVE transit provides services for physically disabled passengers with fixed route buses and paratransit services. WAVE Transit has a fleet of 58 total vehicles, with 54 being ADA

compliant. (The fleet consists of 10 22-passenger minibuses; 2 44-passenger high-floor buses; 18 44-passenger low-floor buses having enunciators; and 25 paratransit vans varying from 1-14, 6-11, or 8-14 passengers. Four of the 25 are not ADA compliant, as are three trolleys.

During evacuations, current protocols in place for New Hanover designate WAVE as providing transport to local shelters for those individuals who have no transportation and those with special medical/physical needs. They would not provide transport to out-of-county locations for shelter operations. Instead, a “staging area” would be identified for the transfer from a WAVE vehicle to a contracted bus or special-purpose transportation vehicle to be taken to a “safe” area. Areas to be used for staging would be Veteran Park, Ashley High School, and Murray Middle School in the south; Cape Fear Community College in the north; and Schwartz Center Community College Campus in the downtown area. Ogden Park also should be considered as a staging area. The local public-transit provider, WAVE, does not provide service to the beach areas on a regular basis.

The current central location for WAVE operations on Castle Street does not provide for an optimum transfer situation due to the fact that there is no shelter from the weather. Plans are underway for a new multimodal transportation center that will be located on College Street. This center will have adequate shelter allowing for transfers from one vehicle to another without exposure to the elements. This will be especially important for those individuals using wheelchairs or other mobility aids.

Use of County School Buses and Contract Vehicles for Emergency Evacuations

Approximately 200 New Hanover County Public Schools buses are available during summer, and about 187 are available during the school year during non-school hours. Of those, about 25 are special-education buses. The State of North Carolina, through its Division of Emergency Management (NCEM), and the Emergency Management Office in New Hanover have an unwritten but understood policy that public school buses will be available and under the control of the local commander in an extreme declared emergency. This policy is understood by the North Carolina Department of Public Instruction as well as local school districts throughout the state. To date, no public school buses have been used in a hurricane emergency in New Hanover County. New Hanover, like other counties in the state, has authorization to arrange contractual agreements with private charter bus companies to provide transportation in an emergency.

Use of Storm Surge Maps in Evacuations

Based on storm surge maps from the 2002 North Carolina Hurricane Evacuation Restudy for the Southern Coastal Plain Region, approximately 8-10% of the land mass of the at-risk counties could potentially be inundated by storm surge from a category 1 hurricane, increasing to 10-15% inundation associated with a category 4 or 5 storm. New Hanover is listed as one of the 12 counties at risk on the North Carolina coast. The southern coastal plain is the most densely populated of the three coastal areas of the state (NCEM 2007).

Evacuation decisions based on successive storm strengths revealed that 84% would evacuate for a category 5 storm, 67% for a category 4, 33% for a category 3, 15% for a category 2, and 11% for a category 1.

Air Service Relevance to Hurricane Evacuations

Most visitors to Wilmington/New Hanover County typically arrive by personal vehicle. A small percentage come by air then rent a car on arrival. Most visitors evacuate, when mandated, using their own or rented vehicles. Wilmington International Airport is served by USAir, Delta, and Allegiant Air. It is also base to 160 general aviation planes. Statistics for 2008 show over 397,000 passengers enplaned and over 393,000 deplaned. Most passengers are business travelers during the fall-winter season with an increase of leisure travelers during the spring-summer season.

Ideally passengers are given a 12-hour notification of the last flight out in the event of severe weather. Notices are given via a direct media feed. The airport never closes but it is not equipped to act as a shelter, so if planes are not flying due to storm conditions travelers are directed to a local shelter.

Emergency Notifications

The Cape Fear Coast Convention & Visitors Bureau (CVB) posts information about approaching storms when the notice moves from a watch to a warning and makes continual updates until the danger has passed. The CVB is an information source of hotels remaining open in the area to accommodate emergency personnel and media during a hurricane or other major weather event. They also provide information on hotels with available rooms as far away as Raleigh, NC (approximately 120 miles) for those leaving the area. The CVB provides phone numbers of transportation providers such as taxi services and information on the location of local shelters.

Emergency management utilizes a “reverse 911” system (DIALOGIC) to alert citizens covering 39 census tracts in the event of severe weather and other events affecting their welfare. However, according to the American Community Survey of 2005-2007, there are 17% (county 14%) of households without telephone service. A recent innovative program being offered in many parts of the US is the government-supported program “SafeLink Wireless,” which provides a free cell phone with airtime minutes each month for eligible customers. SafeLink has recently become available in the Wilmington area. Subscribers qualify by:

1. Being enrolled in State or Federal assistance programs such as Federal Public Housing Assistance, Food Stamps, and Medicaid.
2. The total household income is at or below 135% of the poverty guidelines set by the State or the Federal Government.
3. No one in the household currently receives Lifeline Service through another phone carrier.
4. Subscribers must have a valid United States postal address (no PO boxes). Phones are shipped to the home address.

Emergency Operations Center

New Hanover County's Emergency Management office is also the location of a well-equipped EOC that is maintained on 24-hour readiness posture related to severe weather and other disaster events. Representatives of local first-responder agencies and other support agencies have representative(s) present at the EOC during activation. If an event is known to be threatening, approximately 72 hours prior to impact, the New Hanover County Department of Emergency Management requests the activation of the Individual Care Coordination Center (IC-3). This consists of a bank of 10 telephones and volunteers from agencies participating in the Special Needs Task Force. These are individuals who work with special-needs individuals on a daily basis and volunteer their services when special-needs individuals are at greatest risk. Relocation of special-needs individuals is reserved for those at highest risk whose individual disaster plans have failed, and it is limited by the number of available beds in participating facilities.

The IC-3 (located at New Hanover Regional Medical Center) was first activated with Hurricane Bonnie in 1998, and it was also activated for Hurricanes Dennis, Floyd, Irene in 1999; Hurricane Isabel in 2003; Hurricane Charley in 2004; and Hurricane Ophelia in 2005. During activation for Hurricane Ophelia, RSVP volunteers contacted 592 people in New Hanover County listed on the special-needs registry, making sure the elderly got to shelters if they wanted to or had enough medicine and supplies to get by during the storm. In *The Unthinkable*, Amanda Ripley (2009) reported on a survey following Hurricane Katrina in 2005: out of 680 New Orleans residents interviewed after the hurricane, 64% indicated they did not think the storm would be as bad as it turned out to be.

Emergency Shelters

Five New Hanover Schools are designated as shelters within the county. These designated shelters have been readied for up to a category 3 storm by the installation of film on windows and hardening of the roof structures. Historically the greatest number of shelter occupants has been approximately 1300 individuals, with not more than 250-300 per shelter. When shelters are opened, Red Cross volunteers and Department of Social Services representatives are present at each shelter. Each occupant is registered with one question being "how did you get here?" Most individuals drive themselves, ride with someone, or walk. The largest shelter is located downtown, making it the easiest for the homeless population because they can walk in. A shelter in the northern area of the city is located in an Hispanic area.

New Hanover County has approximately 2,000 long-term care beds in nursing homes and other extended care facilities available in case of emergency. Each facility has its own plan as required by the State of North Carolina. Not surprisingly, some of the plans are very good and some are not. The focus of the plans is more on taking care of "in-house" emergency situations rather than evacuation. Sheltering-in-place is their first choice in a disaster situation. If evacuation from a nursing home becomes necessary, residents must be accompanied by a caregiver.

UNC-Wilmington Integrated Emergency Evacuation and Pre-Disaster Mitigation Plans

Wilmington is home to the University of North Carolina Wilmington, recently recognized by FEMA as a campus that meets the criteria necessary for the designation as a Disaster Resilient University. UNCW has a student population of 12,000+ students, with a faculty and staff of over 2,100. Approximately 15% of the students are from out of state. UNCW's Pre-Disaster Mitigation Plan is an annex to the New Hanover County Emergency Management Plan.

Hurricane exercises are conducted yearly, usually in July after the New Hanover County Emergency Management exercise in June. During new student orientation, a booth is set up and manned to deliver hurricane-preparedness brochures and create awareness of the plan. Brochures are also mailed to parents of students. In the event of a full evacuation and closure of the campus, most in-state students go to their homes and international students can be housed with host families.

In the event of a category 4 or 5 storm, transportation would be provided to relocate students without transportation to another UNC system campus (UNC Charlotte or UNC Greensboro), where they could be staged for pickup by parents or have accommodations arranged. It is estimated that there could be from 100 to 200 students who would require transportation. This plan is based on the availability of buses and drivers. There is no contract for service – only contact information on bus companies. It should be noted that WAVE Transit and New Hanover County School Buses are also a part of the New Hanover Plan.

UNCW does have athletic department buses that could be used, and UNCW is linked to other UNC system campuses via Web EOC, enabling them to communicate needs during extreme events for assistance from other campuses not affected.

Findings and Recommendations

Findings and recommendations from this case study are as follows:

- This case study confirmed the recognized body of knowledge among emergency-management agencies that hurricane evacuations must be managed at the lowest possible organizational and jurisdictional level; in the case of the City of Wilmington and New Hanover County, the “incident commander” would be the County’s Director of Emergency Management, Mr. Warren Lee.
- The level of State involvement in hurricane evacuations depends largely on the county’s needs or requests for external support; for example, requests to the State Department of Public Instruction for the emergency use of public school buses or to the State Highway Patrol for initiating a reverse-flow condition on Interstate 40 going north and west as it leaves New Hanover County.
- The evacuation of large numbers of people (visitors and vacationers, as well as the transportation disadvantaged) from vulnerable areas and isolated areas such as the beaches will stress the capacity of major highway networks and local streets and

particularly bridges, potentially increasing the time necessary to evacuate the threatened areas of high risk. For the disadvantaged groups that need special transportation services, the decision to evacuate should be made at least 24 hours earlier than any mandatory order that would be made for the general population to evacuate.

- Local transportation assets (e.g. WAVE transit buses, New Hanover School buses, and charter buses) that should be available to transport the dependent population and functionally or medically fragile populations are considered insufficient to meet the demand. The State Division of Emergency Management (NCEM) may be requested to supplement New Hanover County with transportation resources for these transportation-disadvantaged groups.

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Part III

Appendices

Appendix A

Useful References for Planning and Conducting Emergency Evacuation of the Vulnerable Population

While conducting this project, UTCA researchers reviewed much of the technical literature appropriate to this field. The best of these materials are presented in this Appendix to assist evacuation and transportation managers with future evacuation situations.

Transit evacuation planning includes many issues. UA researchers identified five of the most important issues: estimating and identifying evacuees, communication, transportation, tracking, and sheltering. Good reference materials were identified for each of these. The list below provides the titles and specific pages within the reports that provide good assistance with these five issues.

Element 1 – Estimating the Number of Evacuees

GAO (Government Accountability Office). *Transportation Disadvantaged Populations: Actions Needed to Clarify Responsibilities and Increase Preparedness for Evacuations*. Report to Congressional Committees, December 2006.

- The report provides a list of categories of people without personal vehicles that can be included in the transportation-disadvantaged populations. Page 15.
- The report reviews some of the reasons why data is not readily available about the location of transportation-disadvantaged populations. Page 16.
- The report also identifies measures taken by different state and local governments to address the evacuation preparedness challenges facing transportation disadvantaged populations. Pages 27-32.

TRB (Transportation Research Board). *The Role of Transit in Emergency Evacuation*. Special Report 294. July 2008. Online at http://www.trb.org/news/blurbs_detail.asp?ID=9264.

- On page 58 this reference provides a list of population groups with potential demand for transit service in an emergency evacuation.
- In this report's example, the 2000 Census and the 2005 American Community Survey were used as primary data sources to estimate the number of people with a potential demand for transit service in emergency evacuation. See pages 84–91.

FHWA (Federal Highway Administration). *Evacuating Populations with Special Needs - Routes to Effective Evacuation Planning Primer Series*. FHWA-HOP-09-022. US Department of Transportation. May 7, 2009.

- This FHWA report provides suggestions on how to gather data on the number and types of people in the special-needs population. See chapter 3, pages 20–21.

FEMA (Federal Emergency Management Agency). *Comprehensive Preparedness Guide 301: Emergency Management Planning Guide for Special-Needs Populations*. CPG-301. August 2008. Online at <http://www.fema.gov/news/newsrelease.fema?id=45435>.

- This report provides information on preparing an informed estimate of the number and types of individuals with special needs. It also provides information about how to establish registries and how to apply geographic information systems (GIS). See pages 13-18.

FTA (Federal Transit Administration). *Transportation Equity in Emergencies: A Review of the Practices of State Departments of Transportation, Metropolitan Planning Organizations, and Transit Agencies in 20 Metropolitan Areas*. May 2007. Online at http://www.fta.dot.gov/civilrights/civil_rights_6343.html.

- This study provides information on the correlation between four demographics of special-needs populations using data from the 2000 Census. See pages 18-30.

Element 2 – Communication with the Vulnerable Population

ASTHO (Association of State and Territorial Health Officials). *At-Risk Populations and Pandemic Influenza: Planning Guidance for State, Territorial, Tribal, and Local Health Departments*. Arlington, VA. June 2008. Online at <http://www.astho.org/Programs/Infectious-Disease/At-Risk-Populations/At-Risk-Pop-and-Pandemic-Influenza-Planning-Guidance>.

- This document provides additional information on communication with and education of at-risk populations before, during, and after emergencies. See pages 46–59.

FEMA (Federal Emergency Management Agency). *Comprehensive Preparedness Guide 301: Emergency Management Planning Guide for Special-Needs Populations*. CPG-301. August 2008. Online at <http://www.fema.gov/news/newsrelease.fema?id=45435>.

- This document provides additional information on how to communicate with the special-needs population during emergencies. See pages 18–25.

FHWA (Federal Highway Administration). *Evacuating Populations with Special Needs. Routes to Effective Evacuation Planning Primer Series* FHWA-HOP-09-022. May 7, 2009. Online at <http://www.ops.fhwa.dot.gov/publications/fhwahop09022/index.htm>.

- This report provides information on how to better communicate with the special-needs population. See chapter 4, pages 29–38.

TRB (Transportation Research Board). *Communicating with Persons with Disabilities in a Multimodal Transit Environment*. TCRP Synthesis 37. Washington DC, 2001. Online at <http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp37/tcrp37.pdf>.

- This document provides an extensive literature review in the area of communication with persons with sensory and cognitive disabilities in transit environment. See pages 8–16.

TRB (Transportation Research Board). *The Role of Transit in Emergency Evacuation*. Special Report 294. July 2008. Online at http://www.trb.org/news/blurbs_detail.asp?ID=9264. 2009.

- The study identifies communication-system qualities that enhance the role of transit in emergency evacuation. See pages 99, 101, 103, and 105.

Element 3 – Transportation of Vulnerable Populations

FEMA (Federal Emergency Management Agency). *Comprehensive Preparedness Guide 301: Emergency Management Planning Guide for Special-Needs Populations*. CPG-301. August 2008. Online at <http://www.fema.gov/news/newsrelease.fema?id=45435>.

- This document provides information on how to identify available transportation resources and suggests major emergency transportation planning considerations. See pages 33–37.

FHWA (Federal Highway Administration). *Evacuating Populations with Special Needs. Routes to Effective Evacuation Planning Primer Series FHWA-HOP-09-022*. May 7, 2009. Online at <http://www.ops.fhwa.dot.gov/publications/fhwahop09022/index.htm>.

- This publication provides information on how to successfully plan transportation during evacuation. See chapter 5, pages 39–48.
- It also provides information on how to store, maintain, and document transportation resources. See chapter 3, pages 17–18.

Element 4 – Tracking the Vulnerable Population

FHWA (Federal Highway Administration). *Evacuating Populations with Special Needs. Routes to Effective Evacuation Planning Primer Series FHWA-HOP-09-022*. May 7, 2009. Online at <http://www.ops.fhwa.dot.gov/publications/fhwahop09022/index.htm>.

- This study provides information on dispatching and tracking. See chapter 5, pages 40–41.

FEMA (Federal Emergency Management Agency). *Comprehensive Preparedness Guide 301: Emergency Management Planning Guide for Special-Needs Populations*. CPG-301. August 2008. Online at <http://www.fema.gov/news/newsrelease.fema?id=45435>.

- This report provides information on patient tracking. See page 40.

Element 5 – Sheltering the Vulnerable Population

FHWA (Federal Highway Administration). *Evacuating Populations with Special Needs. Routes to Effective Evacuation Planning Primer Series* FHWA-HOP-09-022. May 7, 2009. Online at <http://www.ops.fhwa.dot.gov/publications/fhwahop09022/index.htm>.

- Even though the focus of this document is not transportation, it provides some primary considerations in planning for sheltering. See chapter 3, pages 26–28.

FEMA (Federal Emergency Management Association). *Comprehensive Preparedness Guide 301: Emergency Management Planning Guide for Special-Needs Populations*. CPG-301. Online at <http://www.fema.gov/news/newsrelease.fema?id=45435>.

- This document outlines important ideas on how to plan safe and healthy shelters. See pages 25–28.

Appendix B

Review of 2006 Mobile County Hurricane Plan with Respect to Transit Evacuation of Vulnerable Population

Introduction

This portion of the report documents the procedure in place for transit evacuation of the vulnerable population in Mobile County at the beginning of 2007. The information was gathered with the support and cooperation of the Mobile County EMA. Part of the information came from written documents, interviews, and discussions with MCEMA officials and part came from field trips to the MCEMA offices and other sites in Mobile.

It is important to note that changes have been made to this plan since the initiation of this UTCA project. In particular, FEMA has provided funding for detailed plan development by consulting firms and has provided funding to the Alabama EMA for commercial buses to evacuate those without personal vehicles.

Overview of Written Plan

The plan is summarized in simplified form in the following paragraphs. The majority of the material came from the authors' review of the document *Mobile County Hurricane Plan*.

Purpose

The purpose of the plan is to develop procedures and provide a coordinated and orderly plan of operation to minimize effects of hurricanes on residents and visitors in Mobile County, Alabama. The plan covers all mass evacuations and special needs evacuations, and it is an integral part of the Mobile County Emergency Operations Plan (EOP).

Assumptions

The plan assumes that a hurricane will be detected and tracked with adequate time to implement the procedures. When a hurricane strikes, help from the state and federal governments may not be available during the first 24 to 72 hrs; therefore, local government should maintain a combination of governmental and volunteer emergency services and facilities to cope with day-to-day emergencies.

Management of Evacuation

To effectively guide the preparation, evacuation, and recovery processes, the plan establishes two groups: the Executive Group, which has the overall direction and control of the hurricane procedures, and the Operations Group, which acts in accordance with procedures as conditions warrant for its jurisdictional areas and responds to overall directions issued by the Executive Group. The composition of each group is stated but specific roles and responsibilities of agencies and representatives are not stated for the Executive Group.

Levels of Evacuation

The County is divided into four geographical hurricane evacuation zones (See Figure B-3 at the end of this appendix). During category 1 and 2 hurricanes, all people from Zones I and II, mobile homes, and low-lying flood prone areas will evacuate. During category 3, 4, and 5 hurricanes, people from all zones will evacuate.

The primary evacuation routes are designated for different parts of the county. For in-county evacuation, 19 shelters are designated with a total capacity of 10,805; however, the plan does not specify out-of-county shelters.

Transit-Dependent Individuals

The Mobile County Hurricane Plan includes most of the information required to develop a plan for transit-dependent evacuation. However, there are areas not yet specified, such as an implementation time line, detailed responsibilities, shelter activation, and public information in pre-scripted form.

The plan provides the list of required buses, drivers, and pick-up stations for transit-dependent individuals. However, it does not provide an estimate of the number of people who can use the general-population buses and those who need special types of buses and shelters.

Information Provided by MCEMA

Important points from the discussions and interviews of MCEMA officials are reviewed in the following paragraphs.

The current plan has two options for evacuating those without vehicle. For category 1 or 2 hurricanes, individuals will be moved to shelters within the northern part of the county. For category 3, 4, and 5 hurricanes, the evacuees will be moved in two steps: (1) they will be picked up at their homes or at staging areas and moved to a hub (the Civic Center) where they will be registered and undergo triage, and (2) they will travel by school bus from the Civic Center to various junior colleges around the state.

Pick Up and Transport

For evacuees living in the City of Mobile, the WAVE transit system will carry them to the hub. For evacuees living in the rural part of the county, transportation will be provided by churches, nonprofit organizations, and others.

MCEMA has made provisions to obtain enough school buses but will need additional drivers. This detailed on the most recent MCEMA “shortfall list.” The Alabama EMA office will take care of bus fuel and food. For planning purposes, the current projection is that about 300 school buses will be needed for major evacuation. About 200 drivers must be brought to Mobile to drive them, and the Alabama EMA has made arrangements to secure and deliver the drivers.

Time Table

The evacuation of the carless population will start 48 hours from the projected landfall of a hurricane. It will occur over a 12-hour period, from 6:00 a.m. to 6:00 p.m.

Number Estimated to Evacuate by the Mobile EMA

Data from the 2000 Census indicate that the County had a population of 399,842. Of these, 13,410 individuals (3.4%) did not have personal vehicles. This is a relatively low percentage compared to the larger coastal cities in the southeast. It is also smaller than the number estimated by the authors using Census data and recommended methods. However, it is much larger than the number of individuals who evacuated in the past.

Volunteer Mobile

This is a nonprofit volunteer organization involved in transit evacuations, which is a terrific asset. For example, they contact potential evacuees and provide information to them, enroll them in the Registry, and otherwise help them understand and prepare for evacuation. They periodically contact the potential evacuees to make sure they still want to be evacuated if a storm threatens.

In addition, Volunteer Mobile will manage the hub process during evacuation, with 45-50 volunteers on the ground at the Mobile Civic Center. On July 22, 2008, they conducted a mock evacuation scenario for three hours. MCEMA reserved the Civic Center for them. Working with the MCEMA, Volunteer Mobile put feet on the ground and worked out the details for issues like providing signing to instruct evacuees on evacuation processes and locations. This includes where Volunteer Mobile would set up processing stations, how they would get data from evacuees, and where buses will arrive/park/load/depart.

Keeping Track of Evacuees

MCEMA originally had PERMATS software to keep track of evacuees. It was replaced during this project by Phoenix Software, which is web-based and more versatile. At the hub, they

gather crucial information from each evacuee and enter it into the software. The software allows scanning of drivers' licenses, etc., to populate the database. It prints reports and wristbands to keep track of evacuees. For example, a scanner at the door of an evacuation bus can provide a list of all those on board and can allow the driver to track them. There is a pen-and-paper copy for backup if the internet goes down. When the evacuee arrives at the destination, his or her wristband is scanned and the name and arrival date placed in the software.

Contacting Evacuees

The City, County, and Mobile EMS purchased "Connect CTY," which works like a reverse 911. It has call-back service and other options. For example, it can call potential evacuees in all parts of the county in a matter of hours. It can also contact those in a group of zip codes or create other location designations (i.e. trace a location on a GIS map). It can send text messages, record voice messages, and use other communications. The EMS will use it to issue mandatory evacuation messages, and the system will then report how many of those called answered. It has the capability to go to a secondary number if the primary number of an evacuee does not answer.

Traffic Flow at the Hub

The authors of this report were concerned about how the 300 buses would arrive, park, load, and depart from the Civic Center because this is a potential source of congestion and confusion. In addition, the city will likely experience increased traffic flow from anxious drivers, all of which will increase congestion. The parking lots, entrances, and exits of the Civic Center are not conducive to a smooth entrance or internal flow with overflow storage. It would be perfect if the buses arrive at uniform time spacing, exactly 2.5 minutes apart. But this is unrealistic, and groups of buses will likely arrive at the same time. In addition, it is probable that many older evacuees will get tired of waiting and get friends to drop them at the hub. Or even worse, they may drive their own vehicles to the hub and plan to park there. After consultation with MCEMA managers, this challenge was found to be surmountable with assistance from the City of Mobile Police Department and the logistics/transportation expertise of MCEMA managers.

The following pages display four examples from the MCEMA plan (Figures B-1–B-4). They include surge map, evacuation routes, evacuation zones, and a population map.

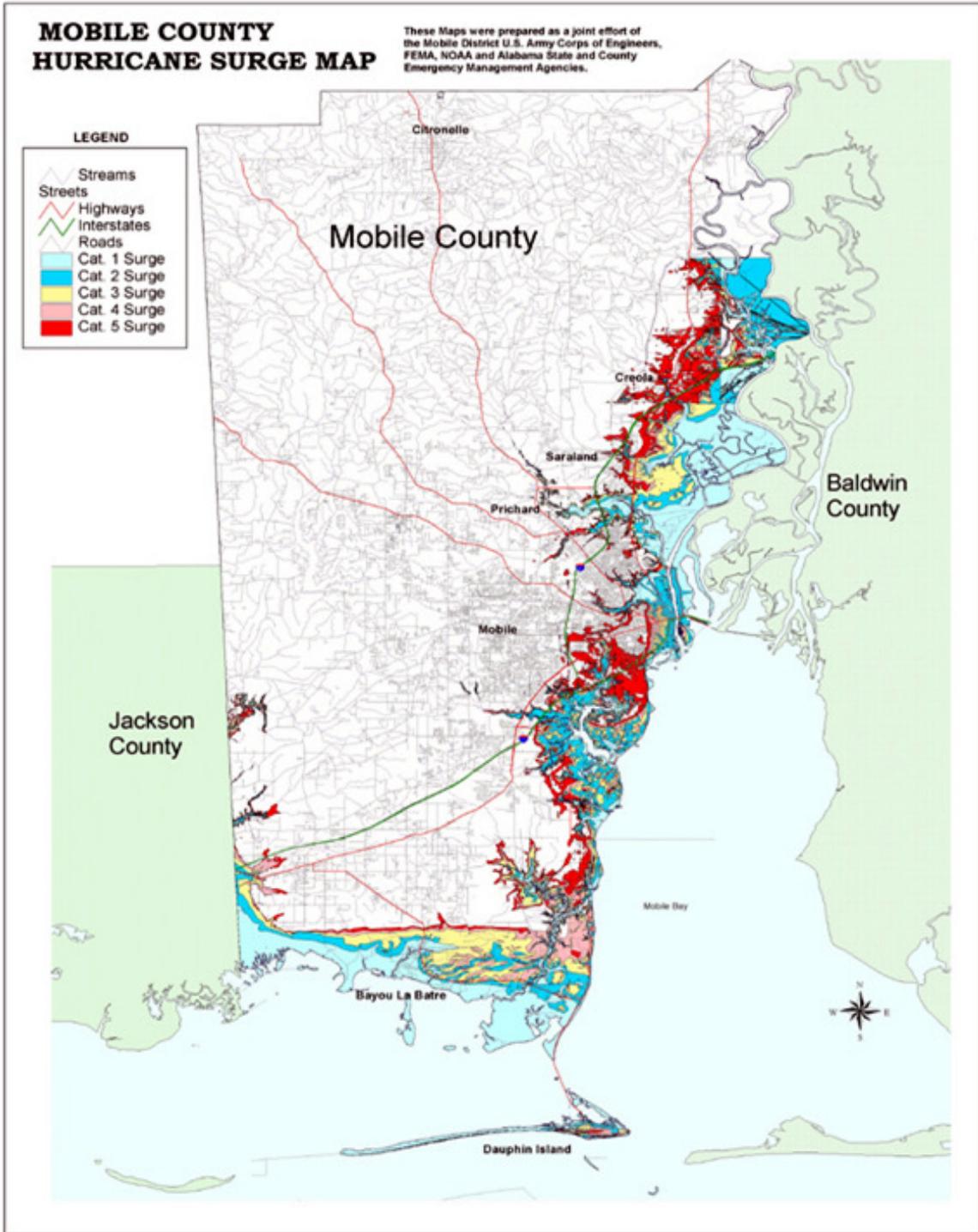


Figure B-1. Surge map (MCEMA 2006)

Evacuation Routes

Mobile County: I-65 North, Highway 43 North, Highway 45 North
 Dauphin Island take Highway 193

Bayou La Batre and Grand Bay take Highway 188 or CR 19 to I-10 East to I-65 North

Mobile Bay at Alabama Port take Highway 193 North
Saraland and Satsuma area can use Highway 43 North or I-65.

Planning

Study the map and the evacuation routes. Plan which roads you are going to take before the hurricane season. Make reservations for motels early or have other plans for lodging. Plan on leaving early due to congested traffic.

When Evacuating – Leave 24 to 36 hours before gale-force winds are expected to hit.

- Bring things indoors
- Look for potential hazards
- Leave natural gas on
- Turn off propane gas service
- If high winds are expected, cover the outside of all windows of your home.

Important Papers to Take With You:

- Driver's license or personal identification
- Social Security card
- Proof of residence (deed or lease)
- Birth and marriage certificates
- Stocks, bonds, and other negotiable certificates
- Wills, deeds, and copies of recent tax returns

Mobile County Area Map

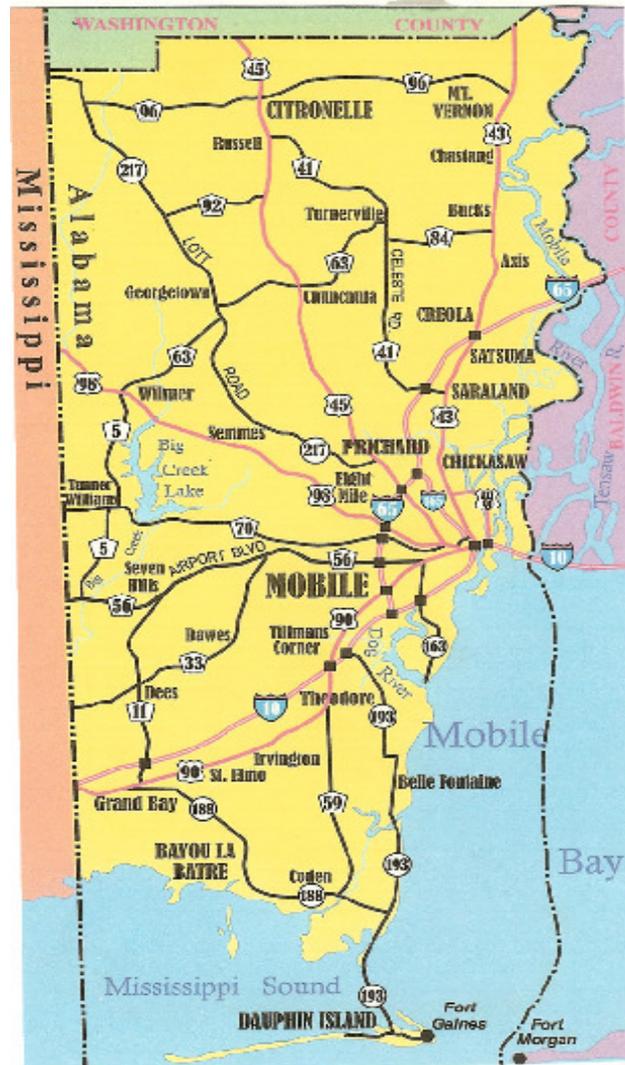


Figure B-2. Mobile County hurricane evacuation routes (MCEMA 2006)

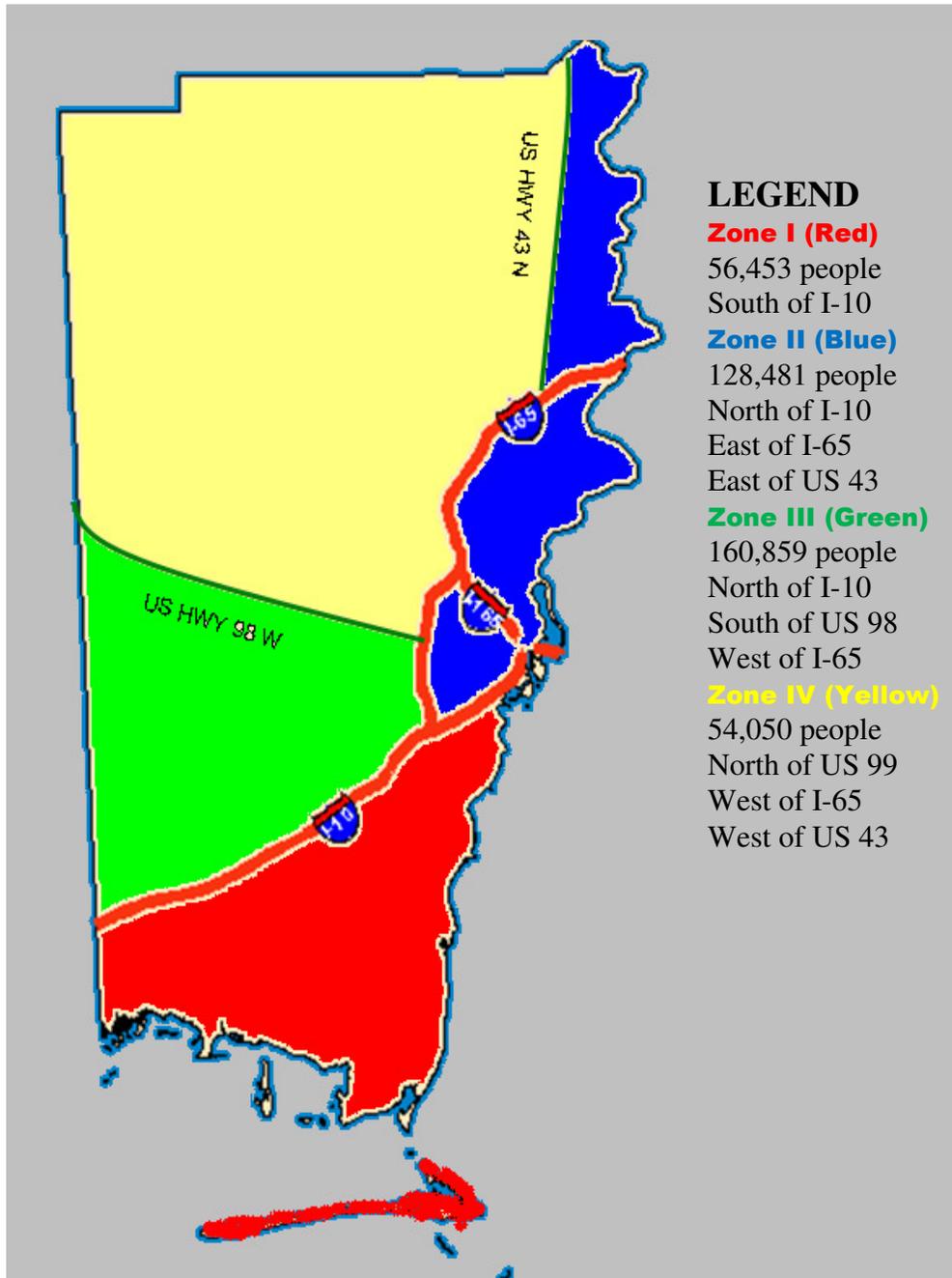
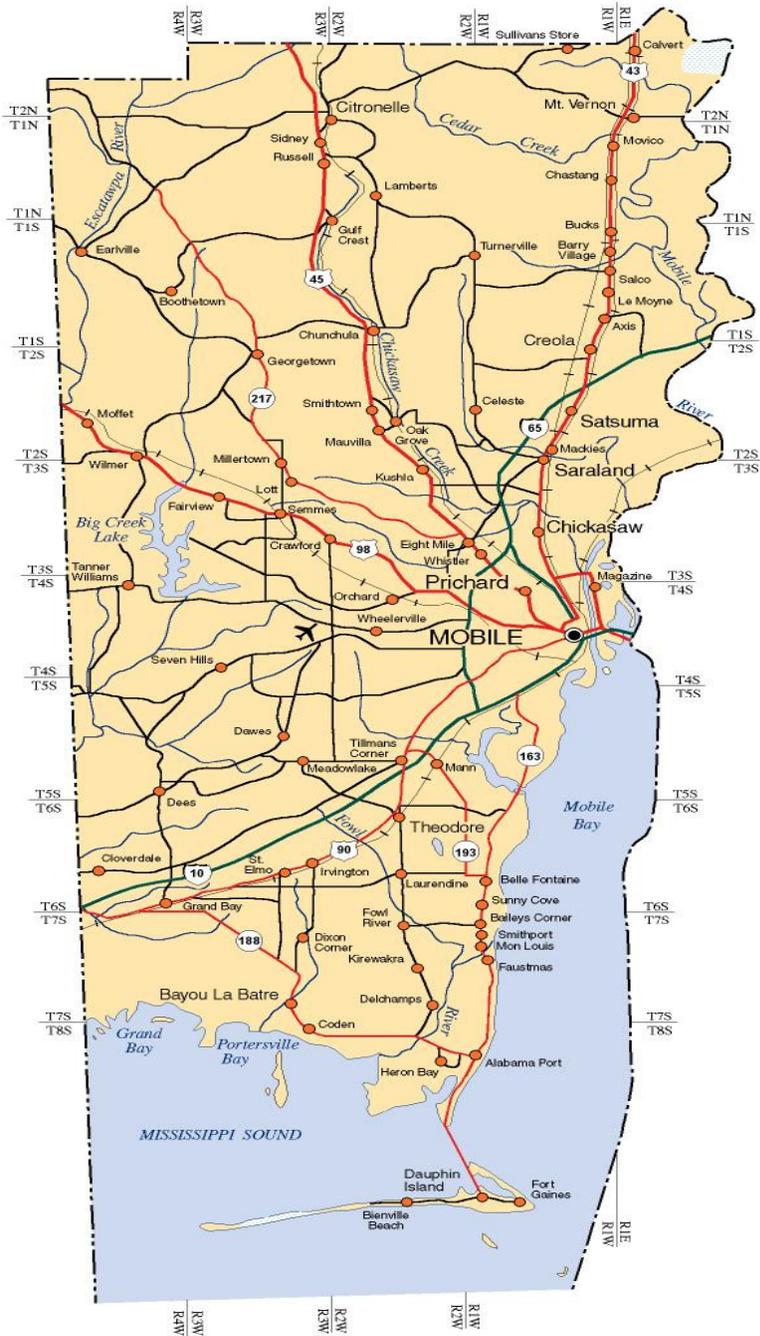


Figure B-3. Evacuation zones (MCEMA 2006)

MOBILE COUNTY



<u>County Population</u>	
Total Population	400,000
Incorporated	271,950
Unincorporated	128,050
<u>Cities</u>	
Mobile	201,000
Prichard	34,000
Saraland	12,000
Satsuma	7,000
Chickasaw	6,600
Citronelle	4,000
Bayou LaBate	3,000
Creola	2,100
Dauphin Island	1,200
Mt. Vernon	1,050
<u>MC Households</u>	
151,000 Households	
Mobile County	
1144 Square Miles	

Figure B-4. Mobile County population map

Appendix C¹

GEMA Standard Operating Procedure: State Assistance in Evacuation of Special-Needs Populations from Georgia Coastal Areas

- i. Purpose: The purpose of this SOP is to provide an overview of GEMA's role in assisting coastal areas with the evacuation of Special-Needs Populations (SpN) and documentation of the process to be used in requesting this assistance. Each Public Health District, under the direction of GA Dept of Human Resources, Division of Public Health, has been assigned the task of developing plans in conjunction with the local EMAs. This SOP will not replace any Public Health District Plan but serves to clarify the process of additional assistance requests to GEMA.
- ii. Assumptions: The following situations and events are assumed to have either taken place or are taking place for this SOP to be activated and used.
 - A. A significant threat to the six coastal counties of Georgia exists. (e.g. Hurricane projected to make landfall directly on the GA coast or near enough to cause significant infrastructure damage and poses a threat to those remaining in the area.)
 - B. The threat requires the evacuation of not only Special-needs populations but general populace.
 - C. The decision to evacuate SpN will be made prior to evacuation of general population.
 - D. It will require at least 12 hours for State procured transportation assets to be in place.
 - E. A mandatory evacuation order will be given by local elected officials due to the seriousness of the threat. The determination of the need to evacuate is a local decision but will be coordinated with state government.
 - F. The Special-Needs Population has been identified and meets the criteria set by DHR Division of Public Health and the local Public Health District to qualify as needing additional assistance not provided in another setting.
 - G. Local resources are not adequate to accomplish the transport of the SpNs.
 - H. A destination (e.g. Special Needs Shelter, Nursing Home, or Hospital) for each evacuee has been designated and is available.
 - I. Prior coordination and planning involving the local EMA requesting evacuation of SpN, local Public Health District and the receiving Public Health District has occurred and directors of all three organizations are aware of the request.
- iii. Responsibilities: The following responsibilities are shown for clarification.

¹ This plan is provided to readers of UTCA Report 08112 as an example of plans that southeastern states have in place for transit evacuation.

- A. GEMA: As overall coordinator for the State of Georgia in disasters and emergency management, GEMA is responsible for the following activities when a request for assistance in evacuating Special-Needs Populations from an endangered area.
1. Receive the request for assistance from the local EMA in conjunction with the affected Public Health District Directors.
 2. Work with ESFs 1, 8 and 13 to rapidly provide transportation that can accommodate SpN that can sit upright and others that can only travel lying down.
 - a. Those SpN that can travel sitting upright should be placed on a conveyance that at a minimum is handicapped accessible, has air conditioning/heat as appropriate and an on-board room equipped with a flush toilet and facilities to wash the hands and face. (Example: Tour Bus, Coach Bus etc. with a lift for wheel chairs). Only in the direst situation should an evacuee be separated from assistive technologies, a caregiver, or a service animal. It should be noted that most vehicles with a wheelchair lift have secured locations for only two chairs.
 - b. Those SpN that must travel in a horizontal position should be placed in a conveyance that can accommodate them lying horizontal on a gurney or similar device; can lock the individual and that device in place to prevent movement; room to accommodate the necessary equipment the evacuee may medically require, and air conditioning/heat as appropriate. (Example: Ambulance, Non-Emergency Transport, Medical Transport, etc.)
 3. Have those assets in place and beginning transport within 12 hours of notification.
 4. Facilitate planning between local EMAs, DHR and Public Health Districts.
- B. Georgia Department of Human Resources (DHR): As the umbrella agency for numerous human service functions of state government, DHR has an important responsibility as coordinator of those services and the agency tasked with primary responsibility for Emergency Support Functions (ESF) -6 and -8 for the state.
1. Coordinate emergency planning between GEMA and DHR Divisions and Offices.
 2. Assist GEMA in coordination of efforts between Division of Public Health and EMAs.
- C. DHR Division of Public Health (DHR-DPH): As the lead for ESF-8, Public Health is responsible for the coordination of ongoing planning and preparation at the local level and in Public Health Districts to address the identification, triage, evacuation (if necessary), sheltering, and return of Special-Needs Populations to the point of origin.
1. Coordinate training and planning to address Special-Needs Population requirements in the state.
 2. Provide guidance to Public Health Districts on Planning for Special-Needs Populations.

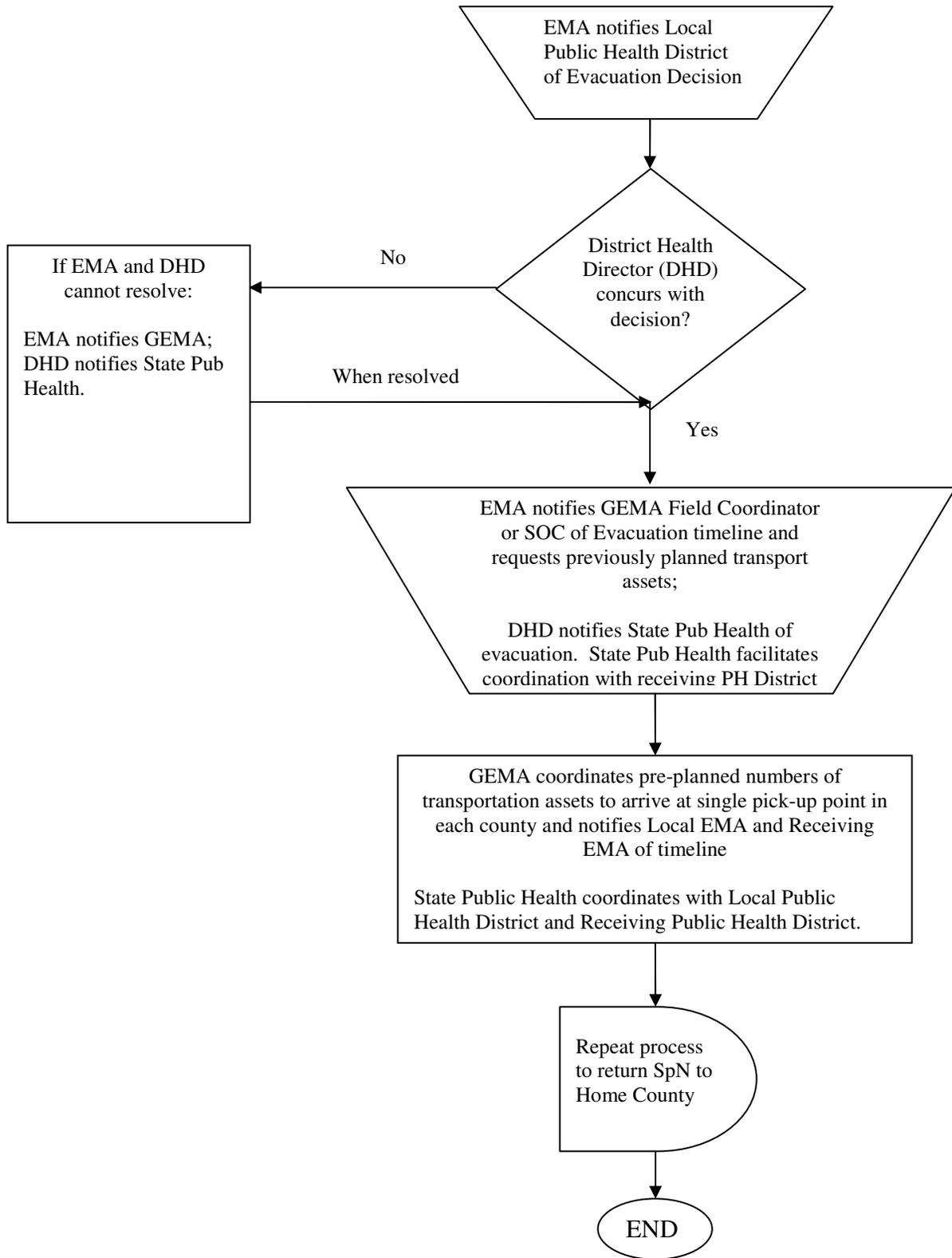
3. Coordinate improvement of shortfalls in staffing, location, supplies etc. for Special Needs Shelters and Populations.
 4. Coordinate Public Health District requests in the State Operations Center.
- D. Georgia State Patrol (GSP): As the lead agency for ESF-13, Public Safety and Security Services, GSP will coordinate with ESF 8 to provide escort for those vehicles transporting Special-Needs Populations from the triage point to the final shelter location. Police escort is necessary to facilitate the rapid movement of these populations to shelters due to the timeliness of the evacuation.
- E. Public Health Districts: Each District requesting state assistance in evacuation of Special-Needs Populations should:
- F. Coordinate with local EMAs in the areas of planning, identification, triage, evacuation, sheltering, and return of Special-Needs Populations.
1. Upon request by the local EMA, be prepared to provide an appropriate means of sheltering Special-Needs Populations at risk. If evacuation of the population to outside of the Public Health District is necessary, coordinate planning and communication with the receiving Public Health District.
 2. If receiving Special-Needs Populations from outside of Public Health District, facilitate planning and communication with the evacuating Public Health District and EMA (both from evacuation area and receiving area).
 3. Assist local officials in the nomination, selection, inspection and certification of Special Needs Shelters or other appropriate housing measures as determined by the Public Health District Director.
 4. Coordinate staffing and supplies for Special Needs Sheltering as well as other requirements as determined by DHR-DPH.
 5. Maintain communication with DHR-DPH with status of planning, requests from EMA, and other information regarding evacuation of SpN.
- G. Local EMA: As the primary coordinator for local citizens, the Local EMA must be involved at all levels of the planning, identification, evacuation, sheltering and return of Special-Needs Populations in their area.
1. Coordinate with local Public Health District in the areas of planning, identification, triage, evacuation, sheltering, and return of Special-Needs Populations.
 2. Provide as early as possible notification to Public Health District and GEMA of intention to evacuate and requirement for sheltering Special-Needs Populations at risk. If evacuation of the population to outside of the Public Health District is necessary, assist Public Health District in planning and communication with the receiving Public Health District as requested.
 3. If receiving Special-Needs Populations from outside of Public Health District, facilitate planning and communication with the evacuating Public Health District and EMA.

4. Assist local officials and Public Health District in the nomination, selection, inspection and certification of Special Needs Shelters or other appropriate housing measures.
5. Assist Public Health District with staffing and supplies for Special Needs Sheltering and other requirements as requested. While Public Health District has the primary responsibility for the staff and shelter, they may need assistance in transportation of staff to the shelter, police escort of supply trucks or other needs best suited to assistance by the local EMA.
6. Maintain communication with GEMA regarding planning, decision to evacuate, communication with evacuating and receiving Public Health Districts and EMAs, ongoing progress and associated issues.
7. Notify GEMA of shortages in transportation assets as soon as identified. It is expected that shortages will be identified during the planning process prior to an actual evacuation. However, events may occur that prevent planned asset availability and require outside assistance in evacuation of these populations. It should be noted that it will take roughly 12 hours from the request until GEMA procured transportation assets begin to arrive.
8. Provide chaperones for each evacuating facility to accompany SpN evacuees to shelters. These individuals can be medical or non-medical personnel as their role is to monitor the passengers and notify driver and EOC of emerging problems during transportation. In the event of any medical situation, they will notify driver to move the bus to the side of the road, contact the EOC to request medical support and report their location. In the event Local EMA is unable to provide chaperones, they should request this assistance at the same time as requesting additional transportation support.

iv. SpN Transportation Assistance Protocols

- A. Upon determination by Local EMA, with concurrence of local elected officials, that evacuation of Special-Needs Populations and General Public is required, the local Public Health District will be notified of the decision.
- B. If the District Health Director (DHD) does not concur with the decision, the local EMA will notify GEMA of the decision and disagreement. The DHD will notify State Public Health of the request and disagreement.
 1. GEMA and State Public Health will review the disagreement and reach a consensus on the correct course of action.
 2. This consensus will be communicated to the Local EMA and DHD. A resolution of the disagreement will be reached as quickly as possible.
- C. Local EMA will notify GEMA of the planned timeline for evacuation. Additional transportation assets, if needed, will be requested from GEMA. These assets will be dispatched to a single location in the evacuating county to transport SpN to a single designated location in the receiving county.

1. SpN need to be evacuated prior to any general-population evacuation. This will reduce trip times and general stress on this population.
 2. From time of request to arrival of first transportation assets will be roughly 12 hours. Proper planning for this lead time, time for the trip and completion of evacuation of the population is essential.
 3. Each county expecting to use GEMA assets to transport SpN populations must notify GEMA and the local Public Health District of this prior to any disaster. Included in this notification will be the total numbers to be transported, number that can transport sitting up, and the number that will require horizontal transport. This info is critical for planning purposes.
- D. State Public Health will coordinate with the evacuating Public Health District and receiving Public Health District to facilitate any triage, transport, or sheltering problems that arise during the evacuation.
- E. When the situation requiring evacuation of SpN populations has passed, the EMA that evacuated, in conjunction with the local Public Health District, will determine if sufficient infrastructure exists to allow the population to return home. Once the determination has been made to return the population, the same procedures will be used as when evacuating initially. Once again, GEMA transportation assets will used only for single point to single point transportation. Any changes in numbers or types of transport needed will be communicated to GEMA at the earliest point possible.



Appendix D

Checklist for Preparing a Transit Evacuation Plan

This check list is from FHWA's *Evacuating Populations with Special Needs*. It has a lot of important information that help prepare a transit evacuation plan.

Task	Date Completed	Notes
Planning and Preparedness		
What local groups did you bring into the planning forum to address evacuations (e.g. local health, EMA, transportation, CRCFs, NGOs)?		
Does the plan clearly define roles for staff? <input type="checkbox"/> Which staff received a briefing and copy of their roles?		
How does the plan identify people with special needs?		
Do you have a registry of people with special needs who may need to be evacuated and does it address their: <input type="checkbox"/> Medical-equipment needs? <input type="checkbox"/> Companion, caregiver/attendant? <input type="checkbox"/> Service animal? <input type="checkbox"/> Household pet? <input type="checkbox"/> Communication needs?		
What agency is responsible for maintaining/updating the registry of those with special needs who may need evacuation?		
How often is the registry updated and disseminated to agencies responsible for evacuating those on the registry?		
How is the need to register communicated to those with special needs?		
How does the plan address the timeline for evacuating those with special needs?		
How does the plan address coordinating transport of those with special needs with the special-needs shelters?		
Do you have copies of all agreements with CRCFs, hospitals, jails, etc.? <input type="checkbox"/> Where are they located? <input type="checkbox"/> Whom do you have agreements with? <input type="checkbox"/> Whom do you not have agreements with? <input type="checkbox"/> Have you ensured that your agency is not the sole transportation provider? <input type="checkbox"/> Is there potential for competition for transportation resources between your agency and CRCFs?		
Describe your system of communication with your local EMA. <input type="checkbox"/> When was it last tested? <input type="checkbox"/> How do plans differ between the planning phase and operations phase?		

Task	Date Completed	Notes
<p>How does the plan address communicating with people who have special needs such as:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Speakers of other languages and those with limited English proficiency? <input type="checkbox"/> People with disabilities? <input type="checkbox"/> People with medical needs? 		
<p>How does the plan address communicating information/outreach to people with special needs about:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pick-up locations for transportation? <input type="checkbox"/> What they can bring with them? <input type="checkbox"/> What services/facilities are available at special-needs shelters? 		
<p>Do you have an inventory of available vehicles for an evacuation and does it address:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Contact information? <input type="checkbox"/> Number and types of vehicles? 		
<p>Describe your staff notification system.</p> <ul style="list-style-type: none"> <input type="checkbox"/> When was it last updated? <input type="checkbox"/> When was it last tested? 		
<p>Describe your agency's staff personal and family preparedness plans for essential personnel.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Describe your back-up plans to fill essential functions if staff cannot fulfill their duties. 		
<p>When were the plans tested and exercised? (Annual exercises are recommended.)</p>		
<p>Which transportation staff received training?</p>		
<p>Communication Needs</p>		
<p>When communicating with CRCFs, have you:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Identified the types of communication resources available prior to an event? <input type="checkbox"/> Ensured that as many agencies and facilities as possible know the communications plan and use the same equipment? <input type="checkbox"/> Conducted routine tests if using a radio system? <input type="checkbox"/> Tested all communication resources on a regular basis? <input type="checkbox"/> Developed a phone tree of key people to contact for transportation during an evacuation <input type="checkbox"/> Do numbers include supervisors, medical staff, facility directors, and others? <input type="checkbox"/> Do you test these phone numbers on a regular basis to update accordingly? <input type="checkbox"/> Conducted a communications drill at least once a year? 		
<p>When preparing for communication with people who have limited English proficiency or are non-English speaking, have you:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Developed written and pictorial illustrations of various words and phrases that may need to be used during the evacuation process and included copies on board all transportation vehicles? <input type="checkbox"/> Did you create consistent, easily readable photo identification badges and shirts for the transportation staff? <input type="checkbox"/> Color-code the shirts and/or badges to identify supervisors, drivers, and other key staff <input type="checkbox"/> Give a printed handout in relevant languages and/or with illustrations to each evacuee being transported. 		

Task	Date Completed	Notes
Transportation Needs During Activation and Operations		
How and when do you notify transportation providers to activate the evacuation?		
How do you track requests for transportation to ensure requests are responded to and to support future planning for transportation?		
How do you monitor the status of the evacuation and report it to your EMA?		
How do you provide staff at the transportation pick-up locations?		
How do you use ITS components to support the evacuation and who is responsible for the operation and monitoring of those components?		
<p>Are transportation dispatchers keeping track of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Driver names/contact information <input type="checkbox"/> Vehicle information (owner, number, license plate, type, capacity, etc.) and assignment <input type="checkbox"/> Route maps <input type="checkbox"/> Locations of fuel <input type="checkbox"/> Contact information for interpreters and translators <input type="checkbox"/> Evacuee information (where available through evacuation registries) <input type="checkbox"/> Contact information for liaisons and other people/agencies that will provide critical up-to-date information <input type="checkbox"/> Names and contact information for people assisting with evacuations (mechanics, personnel at fuel depots, staging area workers, assistants traveling with vehicles) 		
Are checklists placed in all vehicles for field drivers to use?		
<p>Does the field checklist include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Driver ID (name, contact information)/credentials <input type="checkbox"/> Location of mustering areas/staging areas <input type="checkbox"/> Location of vehicle keys and back-up keys <input type="checkbox"/> Emergency contact for drivers and format (e.g. CB radio, Push-to-talk) <input type="checkbox"/> Dispatch contact and alternate <input type="checkbox"/> Route maps and alternate route maps <input type="checkbox"/> Lists of evacuees per vehicle with contact information 		
<ul style="list-style-type: none"> <input type="checkbox"/> Shelter locations and types (e.g. general population, special medical needs, pet-friendly) <input type="checkbox"/> Specialized equipment required (e.g. lifts, foreign language information) <input type="checkbox"/> Fuel locations <input type="checkbox"/> Instructions for breaks and shift changes <input type="checkbox"/> Local information sources (211/511 systems, Highway Advisory Radio (HAR) locations, etc.) <input type="checkbox"/> Point-of-contact for rumor control (e.g. to verify road closures or shelter changes that may be announced by the media or purported by evacuees) <input type="checkbox"/> Worksheets for trip times (departure/arrival), mileage, passenger names/counts, driver name and company/contact information, staging areas, pick-up points, and shelter locations. Detailed records must be kept for any potential reimbursements. 		
Congregate and Residential Care Facilities		
Have all the CRCFs identified a like-to-like facility to which to evacuate, and what agreements are in place to support such an action?		

Task	Date Completed	Notes
How does the plan address communications with CRCFs before, during, and after an evacuation?		
<p>Have you considered, during the planning phase, some of the challenges that transportation agencies should include such as:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Transporting adequate supplies on a continuous basis during an emergency when medical supplies and equipment may be at high demand <input type="checkbox"/> Transporting adequate food supplies <input type="checkbox"/> Coordinating transportation resources that include vehicles with accommodations for people with special needs during evacuations, re-entry, and recovery <input type="checkbox"/> Procurement of medical equipment, supplies, and medication that takes into consideration the full age, disability, and medical needs spectrum <input type="checkbox"/> Working with emergency officials on credentialing issues for “essential transportation personnel” in the context of special needs/CRCF patients 		
<p>Have you considered different scenarios to help with contingency planning including:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Timing of the evacuation (should special-needs populations be evacuated prior to others) <input type="checkbox"/> Specialized equipment to assist with the process <input type="checkbox"/> Different scenarios and the types of evacuation that would occur <input type="checkbox"/> Dealing with medically fragile people who are at high risk 		
<p>How does the plan for CRCFs address:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Vehicle types <input type="checkbox"/> Fuel for vehicles <input type="checkbox"/> Vehicle operators <input type="checkbox"/> Security <input type="checkbox"/> Transport of service animals <input type="checkbox"/> Medical emergencies en route <input type="checkbox"/> Vehicle identification <input type="checkbox"/> Credentialing <input type="checkbox"/> Dispatch and tracking 		
<p>How does the plan address transportation of CRCF support items including:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Durable medical equipment <input type="checkbox"/> Food supplies <input type="checkbox"/> Medical records <input type="checkbox"/> Medicine <input type="checkbox"/> CRCF staff 		
Animal Needs		
<p>How does your plan address transporting different types of animals including:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Service animals <input type="checkbox"/> Household pets <input type="checkbox"/> Farm animals/livestock <input type="checkbox"/> Institutional animals (theme parks, zoos, research labs, pet stores, animal shelters) 		
How are drivers trained for transporting various animal types?		
How are the animals being transported and tracked to their destination, and who is responsible for that tracking?		

Task	Date Completed	Notes
<p>Some key elements must be present in vehicles that transport animals. Have you considered the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ventilation <input type="checkbox"/> Security from attack or disease spread from other animals <input type="checkbox"/> Crates or units that are secured and will not move about or slip from the vehicle <input type="checkbox"/> Crates or units that are not subject to winds and projectiles from driving during transport 		
<p>When transporting animals, have you considered containers that have the following components:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Locking bolts to secure the container <input type="checkbox"/> Metal doors because animals can chew through plastic <input type="checkbox"/> Four metal rods that fasten and secure the door into the container <input type="checkbox"/> No wheels because airlines will not accept such crates <input type="checkbox"/> Sturdy construction with no weak points <input type="checkbox"/> Adequate ventilation <input type="checkbox"/> Enough space for the animal to turn around <input type="checkbox"/> Access and room for food and water <input type="checkbox"/> Access and room for cleaning 		
<p>Does your plan encourage owners to provide animal travel kits that contain the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Proof of vaccination and veterinary records <input type="checkbox"/> Licenses, rabies, and ID tags <input type="checkbox"/> Two weeks of food, water, and medications <input type="checkbox"/> Bedding and toys <input type="checkbox"/> Litter box, litter, and a scoop <input type="checkbox"/> Food and water bowls <input type="checkbox"/> Information on medication and feeding schedules <input type="checkbox"/> Newspapers, pee pads, cleaning supplies <input type="checkbox"/> Collars, leashes, muzzles, harnesses <input type="checkbox"/> First-aid kit <input type="checkbox"/> A manual can opener and spoons <input type="checkbox"/> Stakes and a break-proof rope or tie down 		
<p>Re-entry and Return to Readiness</p>		
<p>How does the plan address re-entry needs including:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Assessment of road conditions <input type="checkbox"/> Identification of re-entry routes <input type="checkbox"/> Fuel availability on re-entry routes <input type="checkbox"/> Security <input type="checkbox"/> Availability of rest areas <input type="checkbox"/> Availability of food and water <input type="checkbox"/> Use of ITS components to support re-entry 		
<p>During re-entry how does your agency track and report to the EMA:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Road conditions and status of whether they are open or closed <input type="checkbox"/> Need for vehicles to transport returning evacuees with special needs <input type="checkbox"/> Status of shelters – open or closed 		
<p>Post-event, how is your transportation agency taking the following actions:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Conduct an after-action debriefing soon after the event (within a week) <input type="checkbox"/> Develop an after-action report to capture lessons learned and actions that worked 		

Task	Date Completed	Notes
<p>Did the after-action debriefing include a facilitator who:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Includes everyone involved in the operation <input type="checkbox"/> Ensures all issues are addressed fully and thoughtfully <input type="checkbox"/> Has participants focus on both positive and negative actions and outcomes, as well as suggested corrections <input type="checkbox"/> Ensures that participants do not feel intimidated or pressured to say something or to silence themselves about events that happened 		
<p>Did the debriefing and after-action report result in revisions of the plan, and how have those revisions been disseminated?</p>		
<p>Did the debriefing and after-action plan identify revised or new training needs, and has that training been completed?</p>		
<p>Did the debriefing and after-action plan identify revised or new contracts or agreements, and have those contracts and agreements been executed?</p>		
<p>How does the plan address seeking reimbursement for the costs of the evacuation?</p>		
<p>As with evacuation procedures, transportation dispatchers should track the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Driver names/contact information <input type="checkbox"/> Vehicle information (owner, number, license plate, type, capacity, etc.) and assignment <input type="checkbox"/> Route maps <input type="checkbox"/> Location of fuel <input type="checkbox"/> Contact information for interpreters and translators <input type="checkbox"/> Evacuee information (where available through evacuation registries) <input type="checkbox"/> Contact information for liaisons and other people/agencies that will provide critical up-to-date information, including medical support personnel who cared for an evacuee prior to the exodus <input type="checkbox"/> Names and contact information for people assisting with evacuations (mechanics, personnel at fuel depots, staging area workers, assistants traveling with vehicles) 		
<p>Driver checklists for re-entry should mirror those used during evacuation, to include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Driver ID (name, contact information)/credentials <input type="checkbox"/> Location of collection points/staging areas <input type="checkbox"/> Location of vehicle keys and back-up keys <input type="checkbox"/> Emergency contact for drivers and format of communication used by the drivers (e.g. CB radio, push-to-talk) <input type="checkbox"/> Dispatch contact and alternate contacts <input type="checkbox"/> Route maps and alternate route maps <input type="checkbox"/> Lists of evacuees per vehicle with their contact information <input type="checkbox"/> Shelter locations and types (e.g. general population, special medical needs, pet-friendly) <input type="checkbox"/> Specialized equipment required (e.g. lifts) <input type="checkbox"/> Fuel locations <input type="checkbox"/> Instructions for breaks and shift changes <input type="checkbox"/> Local information sources (211/511 systems, HAR locations, etc.) 		
<ul style="list-style-type: none"> <input type="checkbox"/> Point-of-contact for rumor control (e.g. to verify road closures or shelter changes that may be announced by the media or reported by evacuees) 		

Task	Date Completed	Notes
Due to potential hazardous road conditions on re-entry, have the vehicles also been equipped with: <ul style="list-style-type: none"> <input type="checkbox"/> Flashlights <input type="checkbox"/> Spare tires <input type="checkbox"/> Flat tire fixative <input type="checkbox"/> Shovel <input type="checkbox"/> Heavy-duty gloves 		
Have vehicles used in the evacuation been: <ul style="list-style-type: none"> <input type="checkbox"/> Cleaned <input type="checkbox"/> Refueled <input type="checkbox"/> Repaired <input type="checkbox"/> Restocked 		

(Source: FHWA *Evacuating Populations with Special Needs*, FHWA-HOP-09-022)

Appendix E

List of Principal Contacts for Mobile Case Study

The following individuals are experts within specialty areas of emergency evacuation. They were contacted by the project staff to gather information about emergency evacuation and to identify resources documents and case studies. The authors express their appreciation for the assistance rendered by these individuals.

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