Florida Statewide Regional Evacuation Study Program

Regional Behavioral Analysis Summary
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CHAPTER III
REGIONAL BEHAVIORAL ANALYSIS SUMMARY
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Chapter III

Regional Behavioral Summary

A. Background

For planners and emergency managers, one of the most elusive components of evacuation planning is anticipation of the behavior of our population. The behavioral analysis is one of the most important tasks in preparing hurricane evacuation plans. It includes the development of the necessary assumptions regarding the manner in which evacuees in and around the threatened area will react to the hurricane threat. Behavioral assumptions based on professional analysis of survey results are the final output of the behavioral component of this study. These assumptions regarding human behavior in an emergency situation become a critical tool in shelter planning, transportation modeling, evacuation decision-making and public information efforts.

The public responses having the greatest impact upon an evacuation are listed below. These tendencies and choices of potential evacuees must be quantified in the behavioral analysis:

1. **Evacuation Rates** - The percentage of population in evacuated and non-evacuated areas that will evacuate during a threat;
2. **Evacuation Timing** - When the evacuation population would leave their residences in response to a hurricane warning, watch, a given evacuation order or recommendation, and landfall;
3. **Vehicle Use** - The number of vehicles that evacuating households would use for evacuation;
4. **Type of Refuge** - The percentage of evacuees that will seek public shelter and other types of refuge such as the homes of friends and relatives, motel/hotels and other locations such as churches, workplaces, and second homes;
5. **Evacuation Destinations** - The location an evacuee travels to in the event of an evacuation. These destinations can include public shelters, homes of friends/relatives, hotels/motels, and destinations out of the region;
6. **Response by Vacationers** - The evacuation response by vacationers, including R.V. park visitors, encompassing evacuation rate, timing, public shelter use, and vehicle use.

Final behavioral assumptions for each county in the region are included near the end of this summary. Further discussion and a detailed explanation of the analysis used to derive primary behavioral assumptions are included in Volume II of the Regional Evacuation Study.
B. Methodology

1. Survey Methodology

To begin the behavioral analysis for the Statewide Regional Evacuation Study program, new behavioral data was compiled from telephone responses to a survey instrument developed for the study by each regional planning council with input from local emergency managers. The wording of survey questions was further refined by Dr. Earl J. Baker of Hazards Management Group. Kerr-Downs Research Inc. administered the survey instrument via telephone interviews and assembled the results for each region as Volume III of the Statewide Regional Evacuation Study. Volume III constitutes a compiled and complete listing of survey results and regional findings from the unprecedented 2007-2008 survey of Florida residents. Further analysis and planning assumptions were developed from the survey results by Hazards Management Group.

The primary aim of the survey was to provide data to assist in deriving evacuation related behavioral assumptions for transportation and shelter analyses. The main focus of the survey was hurricane evacuation, but questions were also asked about evacuation due to freshwater flooding, wildfires, hazardous material accidents, and nuclear power plant accidents. The survey instrument included questions that are important in developing accurate behavioral assumptions for transportation and shelter planning but also incorporated questions deemed useful by county emergency management officials. Meetings were held with county and regional planning council representatives to discuss the questionnaire and related survey issues.

In each non-coastal county of the state, 150 interviews were conducted randomly by telephone. In each coastal county of the state 400 interviews were conducted. The interviews were allocated among aggregations of hurricane evacuation zones (e.g., category 1-2) in the respective counties. The aggregation of evacuation zones and allocations of interviews among the evacuation zones were determined after input from county and regional representatives and varied among counties and regions. Respondents to the survey were also selected in order to reflect aggregations of evacuation zones currently used operationally and in public information materials by counties and to provide appropriate distributions of data that would be necessary to derive behavioral projections as required by the Statewide Regional Evacuation Study. Throughout the East Central Florida region, responses from residents living in the category 1 and category 2 hurricane evacuation zones are aggregated. In order to ensure that respondents resided in the evacuation zones of interest, addresses were selected first and then matched with telephone numbers. Only residences with land-line telephones were called, as sampling was conducted by address. An overview of the survey sample and aggregation of responses is included below in Table III-1.
### Table III-1: Sample Sizes in East Central Florida Counties

<table>
<thead>
<tr>
<th>Site-built Homes</th>
<th>Mobile Homes</th>
<th>SB + MH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brevard Cat 1-4</td>
<td>239</td>
<td>7</td>
</tr>
<tr>
<td>Brevard Cat 5</td>
<td>47</td>
<td>1</td>
</tr>
<tr>
<td>Brevard Non-surge</td>
<td>87</td>
<td>12</td>
</tr>
<tr>
<td>Volusia Cat 1-2</td>
<td>157</td>
<td>16</td>
</tr>
<tr>
<td>Volusia Cat 3</td>
<td>70</td>
<td>4</td>
</tr>
<tr>
<td>Volusia Cat 4-5</td>
<td>68</td>
<td>6</td>
</tr>
<tr>
<td>Volusia Non-surge</td>
<td>63</td>
<td>12</td>
</tr>
<tr>
<td>Lake (Non-coastal)</td>
<td>116</td>
<td>31</td>
</tr>
<tr>
<td>Orange (Non-coastal)</td>
<td>138</td>
<td>10</td>
</tr>
<tr>
<td>Osceola (Non-coastal)</td>
<td>131</td>
<td>16</td>
</tr>
<tr>
<td>Seminole (Non-coastal)</td>
<td>138</td>
<td>9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1254</td>
<td>124</td>
</tr>
</tbody>
</table>

For hazards other than hurricanes, sample sizes are smaller. In most counties, one-third of the respondents were asked about freshwater flooding or wildfires or hazardous material accidents. In counties within the emergency planning zone for a nuclear power plant, one-fourth of the respondents were asked about one of the previously listed hazards or about nuclear power plants.

### 2. Deriving Behavioral Assumptions

Since each evacuation scenario is different and entirely unique, behavioral analysis for evacuation is predictive. The final products of behavioral analyses are basic assumptions that form the best available predictive information regarding likely human behavior. Regardless of how detailed, formal, or quantitative an evacuation plan appears, it contains assumptions about behaviors such as those discussed throughout this study. Every time a clearance time is calculated to determine the length of time required to complete an evacuation under a defined scenario, the model simulations include quantitative assumptions regarding behavioral factors. Behavioral assumptions are also employed in an effort to predict the needed capacity of shelters to house an unknown number of residents that will evacuate to a public shelter. Behavioral assumptions will change over time based on the level of public education regarding evacuation or the level of evacuation experience of a population. The issue is not whether such assumptions are or should be made; but what the assumptions should be.

There is no simple one-rule-fits-all technique for deriving behavioral assumptions for planning. The best solution is to employ the best available mix of indicators, relying most heavily on the best information available for each behavior and scenario in question.

A detailed listing and discussion of behavioral assumptions is included in Volume II of this Statewide Regional Evacuation Study series. However, a few of the most fundamental and critical assumptions are included at the end of this summary.
C. Summary of Behavioral Results

Four out of five residents in the East Central region (82%) have access to the Internet. One in four East Central residents (25%) claims to have visited their county’s website to search for information about hurricanes.

1. Overview

a. Storm Events

As stated previously, the behavioral survey for the Statewide Regional Evacuation Studies focused on the storm events of 2004 - 2005. Due to the varied impact area from the storm events, each of the 11 regional planning councils chose which storms the survey for their region would be based on. Most of the State of Florida was affected by Hurricanes Charley, Frances and Jeanne, in 2004, but other major storms in recent history such as Ivan (2004) and Wilma (2005) dealt regional impacts to other parts of the state. Allowing regions to choose which storm event to focus on lends greater confidence to the entire study. The relative value of survey results are strongly influenced by evacuation survey responses based on actual experience. Survey results from the East Central Florida Region focus on experiences gained from Charley, Frances and Jeanne.

The first, Hurricane Charley, was a fast-moving category 4 storm that unexpectedly changed direction after leaving Cuba at 2:00 a.m., hit the coastline near Fort Myers at 4:00 p.m., and left the state through Daytona Beach at 11:00 p.m. on Friday, August 13. Immediately prior to Hurricane Charley’s unexpected turn toward Ft. Myers, residents in the East Central Florida Region were not anticipating a direct impact. The eye of this storm was small, which created a relatively narrow swath of wind damage along the track. Charley reached the region in the evening hours of August 13th still producing hurricane force winds near the center. The Orlando area received maximum sustained winds of 75 kts and a reported gust of 91 kts. The storm moved off shore near Daytona Beach two hours later with winds between 65 and 70 kts. Charley was the strongest hurricane to hit the United States since Andrew in 1992 and, although small in size, it caused catastrophic wind damage throughout East Central Florida. The storm produced three tornadoes in East Central Florida (one in Osceola County and two in Volusia County).

Evacuation orders were issued for mobile/manufactured homes in Volusia County.

The second, Hurricane Frances, took a more direct path along the northern Caribbean Islands and came ashore in Stuart, Florida in the early hours of September 5th, as a category 2. The eye of this storm was much larger with a larger area of wind damage. Residents in the region expected a decreased impact since the hurricane had travelled across the state. Predictions of the hurricane’s path proved accurate and hurricane-force winds from Frances affected the majority of the East Central Region and resulted in record storm surge heights.
In the East Central Florida Region, evacuation orders were issued for Category 1 areas, mobile and manufactured homes, low-lying/flood prone areas and the Volusia County peninsula.

The final hurricane of the 2004 season was a bit of a wanderer. Hurricane Jeanne hit the northern coasts of many of the Caribbean Islands before turning north at the Turks and Caicos Islands and appeared to be headed off into the Atlantic. However, it looped around and doubled back to head straight for Florida, again making landfall in Stuart on September 26th, this time as a category 3. Jeanne and Frances followed similar paths across the state. Impacts to the East Central Florida Region were also similar with Jeanne being the more powerful of the two.

Again, evacuation orders were issued for Category 1 areas, mobile/manufactured homes, the Volusia County peninsula, and low-lying/flood prone areas. A comparison of the Frances and Jeanne storm events may illustrate changes in behavior learned from previous storm experience as the two scenarios were somewhat similar.

Although East Central Florida was impacted by three hurricanes in the 2004 season, evacuation rates resulting from the storm events are lower than high impact areas. However, evacuation orders were issued; flooding was widespread; and many trees were blown down and extended power outages were common. The effects of the three storms changed our collective attitudes about hurricanes statewide. The town nearest to the intersection of all three storms was Bartow. Additional information on these three hurricanes (and more) can be found in the Hazards Analysis section of this Technical Data Report.

b. Regional Characteristics

The following is a brief description of the region intended to add greater context and meaning relative to the findings of the behavioral survey. The East Central Florida Region has 119 miles of Atlantic Ocean coastline. Brevard County coastal areas of the East Central Florida Region are more commonly known as the “Space Coast.” The label is used to recognize and promote the space industry. The popularity of living near and visiting the coastline of East Central Florida poses possible challenges to evacuation orders.

The general development patterns in the six county region are, for the most part, suburban and urban populations. The total population for the region is 3,144,046 (BEBR, 2007). East Central Florida is the second most populous region in the state behind south Florida. Orlando is the largest city in the region (pop. 185,951).

The average age of the population is a variable that may affect evacuation behaviors and behavioral survey responses/results in the East Central Florida Region. Fifteen percent of the regional population is over 65 years of age. In terms of evacuation, this demographic may be seen as a benefit allowing for a longer response curve that reduces the potential for traffic jams. However, another indication may be that there are greater medical needs and obstacles to evacuation based on mobility.
Like other parts of Florida, the East Central Region is strewn with water bodies including large lake, river and wetland complexes prone to freshwater flooding. The largest of these is the St. John’s River which borders Lake, Volusia, Seminole and Orange counties. Major storm events such as Tropical Storm Fay and the 2004 hurricanes caused major flooding of the areas around the St. Johns River. Additional information regarding flood-prone areas is shown on the 100-year Floodplain Map and included in the Hazards Analysis.

2. Key Findings for the East Central Florida Region

a. Information and Awareness

One of the most valuable bits of information to emergency managers is to understand how people are accessing information about evacuation, and if they comprehend it. Previous surveys have repeatedly shown that most people look to their television for evacuation notices.

Four out of five East Central Florida residents (82%) have access to the Internet. However, only one in four residents with Internet access (25%) claims to have visited their county’s website to search for information about hurricanes. Even though most residents have not utilized their county’s website for hurricane information, almost three out of four residents (74%) of the East Central Florida Region responded with a “yes” when asked, “Have you ever seen a map of your county showing areas that would need to evacuate in case of a hurricane?”

Two in five residents (42%) of the coastal counties in the East Central Florida Region believe they live in an evacuation zone. Unfortunately, survey results indicate that the respondents had only limited knowledge about evacuation zones. Only half (50%) of coastal county residents that live in a category 1 evacuation zone knew that they live in an evacuation zone. Similar results were found for other evacuation zones; however the category 5 zone shows a much lower number. These findings illustrate the need for continued public information and dissemination.

<table>
<thead>
<tr>
<th>Evacuation Zone</th>
<th>Know Evacuation Zone in Which One Lives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>50%</td>
</tr>
<tr>
<td>Category 2</td>
<td>50%</td>
</tr>
<tr>
<td>Category 3</td>
<td>49%</td>
</tr>
<tr>
<td>Category 4</td>
<td>54%</td>
</tr>
<tr>
<td>Category 5</td>
<td>8%</td>
</tr>
</tbody>
</table>

The previous finding indicates a lack of knowledge of evacuation zones, and illustrates the need for dissemination of public information. However, a very high percentage of residents of coastal areas have confidence that Emergency Management officials will issue evacuation notices saying residents should leave their homes to seek safer locations when called for. Residents’ confidence that emergency managers will issue
evacuation notices rises for more severe storms. Response rates for non-surge and inland counties show a high confidence rate, especially for stronger storms, that evacuation orders will be issued when needed.

b. Evacuation Intent

Percentages of citizens who say they will follow mandatory evacuation notices vary depending on the strength of the storm. Compliance with orders for evacuation increases linearly as hurricanes strengthen from category 1 or 2 to 3 to 5. However, percentages of respondents that claim their intent to evacuate are consistently higher than actual evacuation rates. Due to the hypothetical nature of responses, the trend is pointed out but actual numbers are not provided in this summary. As discussed earlier, survey results for hypothetical situations are not consistent with real behavior. Hurricanes Charley, Frances and Jeanne all had an impact on the East Central Florida Region. The East Central Florida Region had not been impacted by a major storm since Hurricane Donna (1960). Evacuation rates are further analyzed and organized by county, for Hurricanes Charley, Frances and Jeanne, and are included with analysis in Volume 2 - Behavioral Analysis. The raw behavioral survey results and survey questionnaire are included in Volume 3 - Behavioral Survey Report.

<table>
<thead>
<tr>
<th>Storm</th>
<th>Evacuated</th>
<th>Neighborhood</th>
<th>County</th>
<th>Elsewhere in Florida</th>
<th>Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charley</td>
<td>20%</td>
<td>3%</td>
<td>6%</td>
<td>8%</td>
<td>3%</td>
</tr>
<tr>
<td>Frances</td>
<td>28%</td>
<td>2%</td>
<td>8%</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>Jeanne</td>
<td>19%</td>
<td>2%</td>
<td>5%</td>
<td>8%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Significant percentages of residents say they intend to evacuate their homes even when the evacuation notice does not apply directly to them. This is termed “shadow evacuation”. Shadow evacuation occurs for a wide variety of reasons and is difficult to quantify. One reason that shadow evacuation occurs is that many people have misconceptions about their vulnerability. Nevertheless, assumptions for shadow evacuation rates must be made to assess and model evacuation traffic patterns. Shadow evacuation rates increase as storm strength increases. The survey results shown below illustrate that shadow evacuation rates are higher in inland and non-surge areas.
Table III-4: Residents That Say They Intend to Evacuate Their Homes Even When the Evacuation Notice Does Not Apply Directly to Them

<table>
<thead>
<tr>
<th>Evacuation Zone</th>
<th>Evacuation Notice for Zones 1 and 2</th>
<th>Evacuation Notice for Zones 1, 2 and 3</th>
<th>Evacuation Notice for Zones 1, 2, 3, 4 and 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>45%</td>
<td>80%</td>
<td>93%</td>
</tr>
<tr>
<td>Category 2</td>
<td>45%</td>
<td>80%</td>
<td>93%</td>
</tr>
<tr>
<td>Category 3</td>
<td>44%</td>
<td>75%</td>
<td>90%</td>
</tr>
<tr>
<td>Category 4</td>
<td>37%</td>
<td>71%</td>
<td>93%</td>
</tr>
<tr>
<td>Category 5</td>
<td>30%</td>
<td>59%</td>
<td>88%</td>
</tr>
<tr>
<td>Non-Surge</td>
<td>61%</td>
<td>73%</td>
<td>90%</td>
</tr>
<tr>
<td>Inland</td>
<td>70%</td>
<td>80%</td>
<td>93%</td>
</tr>
</tbody>
</table>

The table above reveals that non-surge and inland evacuees constitute a higher portion of the overall evacuation effort. The potential evacuation concern is evacuation route congestion caused by evacuees who should otherwise stay home. As stated previously, the reasons for shadow evacuation are numerous; many of them are valid reasons. Educational initiatives encouraging each household to have an evacuation plan and to stock hurricane supplies may be an effective way to reduce shadow evacuation.

c. Evacuation Destination

Regardless of the hurricane strength, most residents of the East Central region intend to go to friends or relatives during an evacuation. Behavioral survey results indicated that between 36% and 40% of evacuees depending on the strength of the storm intend to find safety in the households of friends and family (Figure III-1). Similar percentages were found for those who plan to evacuate to a hotel/motel or public shelter. Approximately 19% of evacuees intend to go to public shelters; however, actual shelter records typically reveal a much lower number.
Most residents intend to evacuate to other places in Florida regardless of hurricane strength (Figure III-2). Almost two-thirds of the residents in site-built homes in coastal counties said they would go out of county when evacuating, compared to half of those in non-coastal counties. Fewer mobile home evacuees said they would go out of county (51% from coastal counties and 36% from non-coastal counties.) The percentages of residents who intend to evacuate outside Florida increase considerably as hurricanes strengthen to category 5. Most residents who intend to evacuate outside Florida will go to Georgia. Specific information regarding evacuation destinations are shown in the following two figures.
Additional evacuation destination information is provided for each county in the Planning Assumptions tables at the end of this behavioral summary. More specific information regarding the analysis that was used to derive the planning assumptions is located in Volume 2 - Behavioral Analysis. The behavioral survey results and survey questionnaire specifically detailing destination information are included in Volume 3 - Behavioral Survey Report.

d. Obstacles to Evacuation

Approximately 3% of East Central residents said there is no vehicle in their household that could be used for evacuation. More than one in ten households (11%) contains an individual who requires assistance during evacuation. Over seven in ten of these households (72%) have an individual who is disabled, has a medical condition or requires some other type of special assistance beyond transportation assistance. Forty-two percent of these households (5% of all households) will require assistance from an outside agency. Only one in four households that require special assistance (24%) have registered with their county as needing special assistance. Therefore, data indicates a need for county public evacuation education material to highlight special needs issues and encourage those requiring evacuation assistance to register with the county.
Table III-5. Household Members Need Assistance to Evacuate

<table>
<thead>
<tr>
<th>Evacuation Zone</th>
<th>Number</th>
<th>Yes</th>
<th>No</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td>1400</td>
<td>11%</td>
<td>88%</td>
<td>1%</td>
</tr>
<tr>
<td>Category 1</td>
<td>150</td>
<td>9%</td>
<td>90%</td>
<td>1%</td>
</tr>
<tr>
<td>Category 2</td>
<td>150</td>
<td>9%</td>
<td>90%</td>
<td>1%</td>
</tr>
<tr>
<td>Category 3</td>
<td>137</td>
<td>10%</td>
<td>89%</td>
<td>1%</td>
</tr>
<tr>
<td>Category 4</td>
<td>100</td>
<td>11%</td>
<td>89%</td>
<td>1%</td>
</tr>
<tr>
<td>Category 5</td>
<td>88</td>
<td>8%</td>
<td>89%</td>
<td>3%</td>
</tr>
<tr>
<td>Non-Surge</td>
<td>175</td>
<td>4%</td>
<td>95%</td>
<td>1%</td>
</tr>
<tr>
<td>Inland</td>
<td>600</td>
<td>14%</td>
<td>85%</td>
<td>1%</td>
</tr>
</tbody>
</table>

More than half of residents in the East Central Florida region (53%) have pets; 89% of these residents plan to take their pets with them if they evacuate. Most residents with pets (92%) are aware that not all public shelters will accept pets, and 11% of these residents claim they will not evacuate because of this fact.

Information on the location of pet friendly shelters should be disseminated with other public education materials. Pet owners need to include pets in their evacuation plans by actively seeking information on rules and procedures for sheltering pets.

D. Evacuation Scenarios

Evacuation behavior can be affected by a variety of external factors as illustrated throughout the behavioral survey results. Several of the most significant factors and likely behavioral responses are discussed in this section.

1. Storm Characteristics

a. Storm Severity

The 2007-2008 behavioral survey results for the East Central Region consistently show a marked difference in responses associated with hypothetical severe storms (Category 4 and Category 5). These results should not be surprising; higher evacuation participation rates make sense. In fact, responses to questions regarding severe storms shown above in Table III-4 indicate that approximately 88% of the population intends to evacuate during a category 5 storm event, if ordered.

Storm severity also plays a significant role in evacuation destination especially with regard to out-of-county travel. Conclusions derived from Hurricanes Charley, Frances and Jeanne participation rates cannot accurately predict the evacuation scenario for a large, highly destructive major storm.

In Florida, evacuation during Hurricane Floyd is one of the best examples of multi-regional, multi-state evacuation caused by a large hurricane. The setting for Hurricane
Floyd in 1999 should be taken into account when attempting to understand the reaction of the populous. Floyd was a strong category 4 storm that had moved on a path directly toward South Florida for several days. The storm was ominous, but forecasters guardedly predicted that Floyd would veer off into the Atlantic and avoid Florida. The storm continued to advance with huge press coverage and did not turn until finally, at the last safe distance, the storm altered its course and skirted the State. Floyd did, however, make landfall in North Carolina as a category 2 storm, causing major damage along the Eastern Seaboard and initiating what Time Magazine described as the largest evacuation in history. The point here is to give an idea of how public response can be affected by an extreme storm.

Evacuation rates in non-coastal counties during Floyd ranged from 12% in the East Central Florida region to 49% in the Charleston, SC region. The average non-coastal county evacuation rate for all 11 regions studied was about 24%. Hurricane Floyd Assessment clearly showed that, in a major storm, people will get in their car and leave their home county. In fact, the 7,000 surveys from the Hurricane Floyd Assessment inferred that 75% of the nearly 3 million evacuees left their county. However, because of the scale of the Floyd evacuation, the chance of reoccurrence must be recognized.

Results for coastal and non-coastal county evacuation need to be continually evaluated and validated by behavioral studies from other storms. As stated throughout this study, every storm presents a unique and different scenario. However, storm severity has consistently been shown to be a significant factor in making the decision to evacuate. Multi-region clearance times are provided in Volume 4 - Transportation Analysis.

b. Landfalling, Paralleling, and Exiting Storm Paths

Storm path can have a significant effect on any evacuation scenario especially with respect to out-of-county evacuation destinations. A comparison of these three storm path scenarios serves as a reminder that every storm is different. Therefore, studies such as this one cannot predict operational decision making. However, a general discussion of potential scenarios can provide useful information to emergency managers for decision making.

i. Landfalling storms are storms that impact the coastline directly. Generally, landfalling storms precipitate the highest surge values and most destructive winds. With regard to evacuation, landfalling storms allow for more alternative evacuation destinations. For example, a storm landfalling in the East Central region would allow for evacuating populations to find safe destinations to the north, south or west of the storm path.

ii. Paralleling storms, like the name suggests, typically travel along the coastline. On the Gulf Coast of Florida paralleling storms are potentially more destructive than on the Atlantic coast due to the counterclockwise spin of a tropical cyclone. Evacuation patterns are typically to the west and away from the storm path, however, for Hurricane Floyd, evacuations proceeded to the north and west.

iii. Exiting storms are storms that have made landfall and, after having travelled across land, are heading back to sea. In Florida, that typically means the storm has
travelled across the peninsula. Relative surge values and wind speeds are typically lower for exiting storms. However, Hurricanes Charley, Frances and Jeanne in 2004 demonstrated that evacuation of vulnerable areas during an exiting storm is often warranted due to the unpredictable nature of storm events. Each of the three storms created a different scenario with unique characteristics. Therefore, operational decisions are difficult to be made in advance. Discussion of storm scenarios only provides a theoretical frame of reference.

2. Evacuation Timing
   a. Long and Short Response

   The timeframe in which people respond to an evacuation order varies. The terms long response and short response refer to the time it takes for evacuees to mobilize following an evacuation notice. Evacuation studies typically express the temporal nature of evacuation response in a “response curve” that is derived from response curves documented in actual evacuation. Traffic modelers, in turn, load the response curve into the model to calculate evacuating traffic counts and predict potentials for traffic congestion during a future evacuation event.

   The most significant factor affecting a long or short response is the urgency of the evacuation order. Response curves are also affected by the media. If a storm changes course unexpectedly or intensifies, it usually becomes necessary to hasten evacuation. Urgency is sometimes inherent due to the relatively inaccurate science of hurricane forecasting.

   b. Phased Evacuation

   In urban areas or in areas with large at-risk populations, phased evacuation is a tool to allow for a more orderly evacuation. In this scenario, specific areas are given a time window in which to evacuate based on the capacity of the roadway to accommodate the expected flow. Phased evacuation is commonly used in the Florida Keys due to the roadway characteristics linking this densely populated string of islands. The effectiveness of staged evacuation relies on accurate behavioral assumptions.

   c. One-Way Evacuation Operation

   One-Way evacuation operation is an evacuation scenario where authorities change the direction of highway lanes to direct all lanes to flow in the same direction. The purpose is to hasten the evacuation of people during a major disaster. When a major hurricane is expected to make landfall, the Highway Patrol will implement reverse lane flow upon an Executive Order from the Governor.

   Currently, only a few highway segments are designated for potential one way evacuation operations in the East Central Florida:

   - I-4 East from Tampa
   - State Road 528 West out of Brevard County
   - Florida Turnpike North from Dade County
The listed highway segments relate to the likely evacuation routes that a significant number of residents living in Florida’s largest metropolitan areas would travel in an evacuation scenario.

In situations where evacuation timing is critical and a few additional hours are needed for evacuation, one-way evacuation operation will speed up the evacuation of residents and tourists. However, one-way evacuation operations are counter-intuitive to the driving public and are only proposed to be implemented during daylight hours. Substantial numbers of public safety man hours are needed to implement the traffic redirection at each interchange. Despite the preparation and man-hour resources needed for implementation, modeling efforts predict only a 33% increase in roadway capacity. Therefore, the applicability of one-way evacuation operations is limited to specific scenarios where the Governor recognizes the urgency for a temporary increase in evacuation route capacity.

E. Evacuation Behavior for Other Hazards

The behavioral survey administered for the Statewide Regional Evacuation Study Program included several questions regarding other disasters that may precipitate evacuation orders. Survey respondents were asked questions about their awareness of vulnerability and willingness to follow evacuation orders if issued. The following behavioral information can be found in Volume 3 - Behavioral Survey Report.

Survey findings included here regarding other evacuation related hazards represent an initial investigation into potential behaviors associated with the hazards examined below. These findings have not been validated through comparison and correlation with similar studies. Therefore, these findings should be considered a starting point for future investigations and analysis.

1. Wildfire

The following questions were included in the survey. Responses and further discussion are found below the questions.

a. Do you believe that your home might ever be threatened by a wildfire?

Only one in four residents of the East Central Region (24%) believes that their area may be threatened by wildfire at some point in the future. This feeling is more prevalent in non-surge zones (34%), while only 9% of residents in evacuation zones 1 and 2 believe their homes may be threatened by wildfire. Residents in Orange County (37%) are more likely to feel threatened by wildfires, while residents of Seminole (8%) and Lake (9%) counties have considerably less concern that wildfires may threaten their areas.

b. If a wildfire threatened your community and public safety officials ordered you to evacuate, would you?

Nearly nine out of ten residents of the East Central Region (89%) claim they intend to evacuate if ordered to do so by public safety officials. This response is highest in non-
surge zones (90%) and inland counties (91%) and lowest in evacuation zones 1 and 2 (65%). Intent to evacuate varies somewhat across counties as 97% of Seminole County residents say they intend to evacuate if ordered to do so by public safety officials, compared to 84% of Brevard County and 85% of Lake County residents.

c. Where would you go if you evacuated because of a wildfire?

Just one in ten residents (10%) intends to go to public shelters while a plurality of residents (45%) intends to evacuate to friends and relatives, and 18% plan to go to a hotel/motel. Inland residents are slightly more likely to go to a public shelter; while residents in evacuation zone 2 (70%) are more likely to go to friends or relatives.

d. Since you’ve been living in this location, have you ever evacuated your home because of a wildfire?

Only 1% of residents surveyed in the East Central Region say they have experienced a wildfire while living in this area. The years specifically mentioned by residents were 1998, 2006 and 2007.

2. Freshwater Flooding

Freshwater flooding in the East Central Florida Region can occur for a variety of reasons including dam failure, riverine flooding and seasonal flooding from rainfall events. Please refer to the Hazards Analysis of this Technical Data Report for specific description of vulnerabilities. The questions below do not refer to any specific flooding scenario or situation.

a. Do you believe that your home might ever be threatened by freshwater flooding?

Nearly one in four residents (23%) of the East Central Florida region say their home(s) might be threatened by freshwater flooding at some point. Forty-one percent (41%) of residents in the category 5 evacuation zone are more likely to make this claim, while only 10% of residents living in non-surge zones think their homes may be threatened by freshwater flooding at some point.

b. If freshwater flooding threatened your community and public safety officials ordered you to evacuate, would you?

Almost three in four residents in the East Central Region (73%) maintain they will evacuate their homes if ordered to do so by public safety officials because of freshwater flooding. This percentage is lower than the 89% of residents who claim they will evacuate because of wildfires. Residents living in category 5 evacuation zone are more likely (87%) to say they intend to evacuate for freshwater flooding if ordered to do so by public officials as compared to the other zones. Osceola County (81%) residents are more likely to intend to evacuate if ordered compared to only 66% of Volusia County residents and 68% of Lake County residents.

c. Where would you go if you evacuated because of freshwater flooding?
Thirty-seven (37%) percent of residents intend to evacuate to friends or relatives if ordered to evacuate by public officials as a result of freshwater flooding, especially those living in evacuation zone 5 (57%). One in ten residents (10%) maintains they will go to a public shelter (25% of residents in evacuation zone 5). One in five residents (20%) intends to evacuate to a hotel or motel with 31% of non-surge zones residents intending to do so.

d. Since you've been living in this location, have you ever evacuated your home because of freshwater flooding?

Few residents of the East Central Florida Region (3%) indicate they have experienced freshwater flooding while living in this area. The years cited by residents as years in which freshwater flooding occurred were 1990, 1997, 2000, 2001 and 2004. During these events most residents sought shelter with friends and relatives.

3. Hazardous Materials Spill

a. Do you believe that your home might ever be threatened by a hazardous material accident?

Relatively few East Central Florida residents (16%) believe they will be threatened by a hazardous material accident. Concern for this type of accident peaks in non-surge areas at 43% while, in contrary, no respondents residing in the category 5 evacuation zone believe their homes would ever be threatened by a hazardous materials accident.

Belief of future threats from a hazardous material accident varies widely across counties in the East Central Florida Region and is highest in Brevard County (28%) and lowest in Orange County (6%).

b. If a hazardous material accident threatened your community and public safety officials ordered you to evacuate, would you?

While few residents (15%) believe they are threatened by a future hazardous material accident, a high percentage (91%) say they intend to evacuate their homes if public safety officials ask them to do so in response to this type of accident.

c. Where would you go if you evacuated because of a hazardous material accident?

Forty-two percent (42%) of residents in East Central Florida would evacuate to a friend or relatives’ home while 16% and 13% would evacuate to a hotel/motel or public shelter, respectively. Residents of Brevard and Volusia Counties are less likely to seek refuge at a public shelter than the four inland counties of East Central Florida.

d. Since you've been living in this location, have you ever evacuated your home because of a hazardous material accident?
Only one percent of residents in the East Central Florida Region reported that they have evacuated due to a hazardous material accident in the region.

e. Suppose there was a hazardous material accident but public safety officials advised you to close your windows and doors, turn off your air conditioner, and stay indoors rather than trying to evacuate. Would you stay indoors rather than trying to evacuate?

Three out of four residents in the East Central Florida Region (75%) claim they will follow public safety officials’ instructions to stay indoors rather than trying to evacuate.

4. Nuclear Power Plant Incident

No nuclear power plants are found in the East Central Florida Region. Therefore, these specific questions were not asked in our region during the survey. However, southern Brevard County is found in the plume of the St. Lucie Nuclear Power Plant and Lake County is an Ingestion Pathway County for the Crystal River Nuclear Power Plant. These counties do have the potential of being effected by an incident at these plants.

F. Use of Survey Findings

Responses to individual survey questions alone are not usually good indicators of how residents will respond in actual threats. A mix of the following indicators was used in deriving behavioral assumptions to use in planning:

- Intended responses
- Responses in past threats
- Responses in past threats in other locations
- Factors usually correlated with actual response

1. Intended Responses

Some of the survey questions asked respondents what they would do in certain situations including whether they would evacuate and where they would go. Answers to those questions constitute intended responses and they provide a very straightforward indicator of behavior. Unfortunately, intended responses often do not match actual responses; people often don’t do what they said they would do. In some cases there are statistical adjustments to intended responses that result in much closer matches to actual behavior. For example, in most locations actual use of public shelters is only about half the level indicated by intended response surveys.

2. Actual Responses

A number of survey questions asked interviewees how they responded in past hurricane threats. Survey participants from the East Central Florida Region were asked about their evacuation behavior in Hurricanes Charley, Frances, and Jeanne. Responses in past threats can be good predictors of future response, but only if the past threats are similar to future threats. For other behaviors such as type of refuge and destination, past responses can be
compared for consistency from one evacuation to another and can be used as a comparison with intended responses.

3. Past Response in Other Locations

Although all places are different, responses and patterns observed in one set of locations are often good indicators of what can occur elsewhere, when conditions are similar. This is particularly useful when planning for threats for which there is no reliable response data for similar threats for the region. As part of the Statewide Regional Evacuation Studies (SRES), twelve different hurricane threats were asked about in one county or another. In addition, public response has been documented in many other hurricane threats both in and out of Florida, some of which are relevant to planning in the East Central Florida region. For example, in the great majority of evacuations fewer than 15% of evacuees leave on their own, prior to an evacuation notice being issued by public officials. Due to the consistency of that finding, it is reasonable to apply it to the counties in the East Central Florida region.

4. Statistical Predictors

Data from other hurricane evacuation surveys like those described above have been analyzed statistically to identify factors that have been correlated with evacuation behavior. Certain variables have been found to predict actual response better than others. For example, perceived vulnerability, actual vulnerability (e.g., evacuation zone), housing type, and hearing evacuation orders are all good predictors of whether residents will evacuate. The Statewide Regional Evacuation Studies (SRES) survey measured perceived vulnerability, evacuation zone, housing type, and expectation of being told to evacuate. Those factors were combined to provide an indication of whether interviewees would evacuate in certain storm threats, from certain locations, and from certain types of housing. Other variables were used to provide an indication of other evacuation behaviors.

5. Combining Information

There is no simple one-rule-fits-all technique for using the above information in deriving behavioral assumptions for planning. The best solution is to employ the best available mix of indicators, relying most heavily on the best information available for each behavior and scenario in question, for a particular county and storm threat. When good, reliable actual response information was available for a certain storm threat scenario, it was relied on more than other types of information. When actual response information was lacking, a combination of intended response, trends from other locations, and application of predictor variables was used.

6. Sample Size Considerations

SRES survey statistics were derived from the sample described previously (Table III-1 in Section B.1. above). The sample provides an estimate of values for the population of people from which the sample was drawn. For example, a sample of Volusia County residents was interviewed for the purpose of estimating how the larger population of Volusia County residents would respond to the same questions.
The sampling plan used in the SRES survey was designed to provide statistically useful county-level data, given budgetary constraints. However, sample estimates become less reliable statistically when the responses are disaggregated, as they were in the analyses conducted as part of the SRES. When responses are broken down by evacuation zone within a county and then by housing type, population-level differences among zones and between housing types, responses are not always as large as they might appear in the sample. This is because sampling error increases when sample size decreases. Therefore, differences in the sample may not be large enough to support a conclusion that similar differences exist in the population from which the sample was selected, due to sampling error.

Aggregating results across counties helps overcome zonal and housing disaggregation problems. However, county variations – if they exist – are masked when results are aggregated at the regional level. The analysis looked at survey results at both the county and regional levels, relying on county-level data to the extent that sample sizes justified that level of analysis, but relying more on regional data when county-level sample sizes were too small.

This is especially true for actual response data. Many SRES respondents were not living in their current county when past storm threats occurred, so they were not asked about their response in those storms. If a resident was living in the area at the time but didn’t evacuate, that person couldn’t be asked where he or she went (e.g., public shelter, out-of-county). Therefore, for certain actual response questions, regional statistics were more meaningful than county statistics.

G. Planning Assumptions

Specific planning assumptions for residents are shown in the following tables. Appearing below each set of tables is a brief description of the content of the table. For a more in-depth analysis of the planning assumptions, refer to Volume II Behavioral Planning Assumptions.

There are 14 tables for each coastal county:

1. Evacuation rate for site-built homes
2. Out-of-county trip rates for site-built homes
3. Percent of available vehicles to be used by site-built homes
4. Public shelter use rates for site-built homes
5. Friend and relative use rates for site-built homes
6. Hotel and motel use rates for site-built homes
7. Other refuge use rates for site-built homes
8. Evacuation rate for site-built homes
9. Out-of-county trip rates for mobile and manufactured homes
10. Percent of available vehicles to be used by mobile and manufactured homes
11. Public shelter use rates for mobile and manufactured homes
12. Friend and relative use rates for mobile and manufactured homes
13. Hotel and motel use rates for mobile and manufactured homes
14. Other refuge use rates for mobile and manufactured homes
Planning assumptions for six evacuation zones are included in the tables:

1. Areas needing to evacuate due to storm surge flooding from category 1 hurricanes
2. Areas needing to evacuate due to storm surge flooding from category 2 hurricanes
3. Areas needing to evacuate due to storm surge flooding from category 3 hurricanes
4. Areas needing to evacuate due to storm surge flooding from category 4 hurricanes
5. Areas needing to evacuate due to storm surge flooding from category 5 hurricanes
6. Areas not needing to evacuate due to storm surge flooding from hurricanes

Zones were defined relative to zones currently used by each county. In instances where counties currently aggregate zones, the planning assumptions were interpolated for intermediate zones. For example, if a county used zones 1-2, 3, and 4-5, trends across those zones were used to specify assumptions for zones 1, 2, 3, 4, and 5.

1. Evacuation Rates

Evacuation rates refer to the percentage of people who will leave their homes to go somewhere safer during a hurricane threat. This is a critical variable for planning because it drives the number of vehicles on the roadways during an evacuation. Responses will vary even for hurricanes of the same intensity, dependent upon how great the threat appears to be to one’s specific location, as well as other factors. Evacuation rates on the periphery of warning areas tend to be lower than in areas closest to the projected path of a threatening storm. A strong category 4 hurricane which has maintained its intensity for a day or more prior to landfall will elicit greater response than one which intensifies from a 2 to a 4 just six hours prior to landfall or one which weakens from a 4 to a 2 twelve hours prior to landfall. Both media attention and actions by public officials will vary from one strong category 4 hurricane to another due to similar considerations. A large category 4 storm will receive greater attention from media and officials than a small category 4 storm (e.g., Floyd, “Andrew’s Big Brother”). Actions by public officials have a great impact on evacuation rate. People are much more likely to evacuate, especially in strong storms, when they believe they have been ordered to evacuate than when they believe they have received a recommendation to evacuate or haven’t been told at all whether they should evacuate. A problem is that many people (often 30% in category 1 evacuation zones) fail to hear, comprehend, or believe that evacuation orders apply to them. The methods and aggressiveness used to disseminate evacuation notices affect evacuation rates.

The planning assumptions for evacuation rates are the maximum probable rates. They assume that a threatening storm of a given category poses its greatest threat to each county. That is,

a. The storm’s forecast track is over the county early and throughout, at least, a full day of the threat.

b. The storm has been at the specified intensity for at least a day of the threat and remains at that intensity until landfall.

c. The storm makes landfall in the county.

These conditions are not met very often, and recent threats in the East Central Florida region have not generated evacuation rates as high as those in some of the planning
assumptions. In fact in the 12 storms asked about in one county or another as part of the Statewide Regional Evacuation Study, the highest evacuation rates observed for site-built homes in the category 1 evacuation zone in any county was 80% (Santa Rosa in Ivan and Nassau in Floyd). Evacuation rates over 90% have been documented in other threats (e.g., Escambia in Frederic, parts of Pinellas in Elena, most of coastal Georgia and southern South Carolina in Floyd, and Galveston, Texas in Rita).

Applying the county planning assumptions to the entire region overstates the evacuation rate for the region because not every county in the region will meet the conditions. However, one does not know in advance the county to which they will apply, if any.

The planning assumptions assume that officials issue mandatory evacuation orders for surge-related evacuation zones for hurricanes of corresponding intensities (e.g., everyone in the category 1 evacuation zone is ordered to evacuate in a category 1 hurricane). It also assumes that all mobile homes and residents of manufactured housing are ordered to evacuate for hurricanes of all intensities.

The planning assumptions include shadow evacuation – people leaving from areas and structures not ordered by officials to evacuate. These assumptions can add substantially to the total number of people evacuating and generating shelter demand, but the phenomenon exists, particularly when conditions such as those enumerated above, apply (storm is forecast for an extended period to strike the county, maintains its intensity, and makes landfall in the county).

2. Out-of-County Trips

Many evacuees travel farther than necessary to reach safety which increases evacuation clearance times. The planning assumptions indicate the percentage of evacuees who will travel to destinations outside their own county. The Survey Data Report lists the actual destination (i.e., city) where survey respondents said they would go and where actual evacuees have gone in the past, if they said they would go or went beyond their own neighborhoods.

Evacuating out-of-county has occurred in the past and will continue in the future until officials are more successful at dissuading evacuees from evacuating out of county. Very few out-of-county evacuees seek refuge in public shelters. The great majority go to the homes of friends and relatives or to hotels and motels. Because evacuation rates were low in recent storms, out-of-county trip rates are based on the minority of residents who evacuated and might not be the same if evacuation rates had been greater.

3. Type of Refuge

Separate tables depict the percentage of evacuees who will go to public shelters, the homes of friends and relatives, hotels and motels, and other types of refuge (such as churches, workplaces, and second homes). Survey respondents tend to overstate their likelihood of using public shelters and understate their likelihood of going to the homes of friends and relatives. Actual refuge use is the best indicator.
Planning assumptions for the counties reflect a reduced value of the intended public shelter use figures unless actual response values were consistent with the intended behavior. The ability of evacuees to actually go to their intended refuge or to the places they have gone in the past will depend of the availability of those refuges in future threats.

4. Percent of Available Vehicles

Many evacuating households tend to take only a portion of the vehicles available to them, mainly to avoid separating the family more than necessary. The planning assumptions indicate the percentage of vehicles available to households that will be used in an evacuation. The Survey Data Report includes the number of vehicles available to evacuating households and the number they would take. The percent-of-available figures are derived from those data. Although planners could use the number of vehicles per household from the Statewide Regional Evacuation Study survey and reported in the Survey Data Report, census data should provide better statistical estimates of the number of vehicles available to households, to which the percent-of-available multipliers can be applied. The SRES survey asked only about intended vehicle use, but a large number of post-storm surveys have asked about actual vehicle use. The intended use figures tend to match the actual use figures well.

5. Evacuation Timing

Not all evacuees leave at the same time. Some leave before public officials issue evacuation notices, some leave very soon following issuance of evacuation notices, and some wait until shortly before they expect the threatening storm to arrive.

a. Evidence from Past Evacuations

Many surveys documenting response following hurricane evacuations have asked evacuees to indicate the time and date when they departed their homes. The responses have been graphed to depict cumulative evacuation curves. The curves show how the evacuation (on the y-axis) grew over time (on the x-axis), typically with a few people leaving early and then increasing to the point at which 100% of the evacuees had eventually departed. The curves indicate when vehicles enter the evacuation network as evacuating vehicles, not when they reached their destinations or when they made other trips in the network prior to evacuating.

In general, a graph of when evacuees depart is often an “S” curve. In some evacuations the “S” is compressed laterally (i.e., over time) to appear thin and upright. These curves occur when all departures occur in a relatively short period of time. They usually happen when evacuation notices were issued due to an unexpected change in a storm’s track, forward speed, or intensity and a rapid response is necessary. By the time evacuation notices are issued, little time remains before anticipated landfall, so evacuees leave with a sense of urgency corresponding to the threat. This would be referred to as a relatively “fast” or “quick” response.

In other evacuations the “S” is stretched laterally with departures being distributed over a longer length of time. It looks “flatter.” In these cases, evacuation notices were issued
well in advance of anticipated landfall of the storm, and residents feel that they had the luxury of waiting longer before departing. Departures are distributed over a longer period of time than in the first example. This is referred to as a “slow” response.

There are also evacuation timing curves that fall between these two responses, resulting in an “S” that is less compressed than the first, but less stretched than the second. This evacuation results when evacuation notices are issued earlier than in the first example, but not as early as in the second case.

In all three scenarios evacuees collectively take as much time as they believe is available to them. Perceptions about the urgency of the evacuation account for variations in whether the evacuation is “quick,” “slow,” or “normal” (in between).

b. Response Curves for Planning

The three evacuation timing scenarios described above are depicted graphically in Figure III-3. The slowest of the three curves assumes that evacuation notices were issued at least 24 hours before landfall. The fastest of the three assumes that evacuation notices were issued just 12 hours prior to the anticipated onset of hurricane conditions.

**Figure III-3: Response Curves for Evacuation Planning**

![Response Curves for Evacuation Planning](image)

**c. Variations in the Curves**

The haste in which evacuees depart is mainly a function of the perceived urgency of leaving sooner rather than later. Variations from storm to storm are usually a function of forecasts. If a forecast changes to indicate that landfall will occur sooner than previously anticipated, more people will started leaving. If the intensity of a storm
increases, indicating that additional areas of a community need to evacuate, departures from those areas will increase. These changes influence public response primarily through evacuation notices and instructions provided by local officials. Officials can significantly affect the distribution of departures the timing of evacuation notices and how notices and related announcements are worded.

In each threat scenario, occupants of less vulnerable areas (e.g., inland) will tend to wait longer to evacuate than those living in more hazardous locations (e.g., beaches). Variation in the curves is a function of variation in the perceived urgency of evacuating promptly, not demographics.

People prefer not to evacuate at night but will do so if necessary as with Eloise, Elena, and Opal. Relatively few people leave prior to the issuance of evacuation notices by officials. People are willing to leave before watches and warnings are posted by the National Hurricane Center if asked to do so by local officials.

d. Examples of Actual Response Curves

Respondents to the Statewide Regional Evacuation Study survey were not asked when they departed in past evacuations because too much time had passed between the evacuations and the interviews to trust the accuracy of recollections. The questions would also have made the interviews unacceptably lengthy. Ample actual response curves have been documented in other surveys.

i. Two-day Evacuations

If officials issue evacuation notices more than 24 hours prior to anticipated landfall, evacuation departures will be distributed over a period longer than 24 hours. Some evacuees will leave shortly after the evacuation notice during daylight hours, then departures will essentially stop on the evening of the first day, and then resume on the morning of the second day.

Most of the recent evacuations in Florida and elsewhere have taken place over a period of more than 24 hours. This has been the result of evacuation notices having been issued more than 24 hours prior to arrival of the storms. Curves were constructed for 11 different coastal regions in Floyd, for example, including four regions in Florida, and all 11 curves were distributed over more than a 24-hour period. The evacuations for all four of the 2004 major hurricanes in Florida (Charley, Frances, Ivan, and Jeanne) covered more than 24 hours. Evacuation departures in Katrina in Mississippi and Louisiana and in Rita in Texas in 2005 occurred over a period of two days or more. The same was true of Bertha and Fran in South Carolina in 1996, Georges in Florida in 1998, Lili in Texas and Louisiana in 2002, and Isabel in Virginia and Maryland in 2003.

ii. One-day Evacuations

The prevalence of two-evacuations stems from good forecasts and a precautionary approach by public safety officials, particularly in stronger storms. If the National Hurricane Center moves forward with plans to extend the lead times
for Hurricane Watches and Warnings by 12 hours, early issuance of evacuation notices will probably continue.

However, good early forecasts will not always be the case, or, for other reasons, evacuations notices cannot be issued early enough to afford the luxury of having two days in which to evacuate. In those instances evacuations in certain areas will need to be rushed to completion following issuance of evacuation notices, and the duration of evacuations will be less than two days. If the goal of clearance time calculations is to estimate the minimum amount of time necessary to complete an evacuation safely, response curves of shorter duration than two days should be assumed.

The quickest of the one-day curves assumes that all evacuees depart within 12 hours of an evacuation notice being issued, with just 10% having left prior to the evacuation notice. Examples of approximately 12-hour response curves are Broward and Miami-Dade Counties in Andrew in 1992, Pinellas County in Elena in 1985, and Escambia County in Frederic in 1979. Storms in which evacuation departures were distributed over a 12 to 18 hour period include David in Miami-Dade in 1979 and Opal in northwest Florida in 1995. Eloise in northwest Florida in 1975 is a rare example of evacuation departures occurring over a period of just six hours, but in some locations as little as 45% of the public evacuated.

H. Planning Assumptions for Vacationers

Compared to residents, there is relatively little data documenting how vacationers respond to hurricane threats, and no Statewide Regional Evacuation Study survey was conducted with vacationers to ascertain their intentions. Recommendations for behavioral assumptions for tourists are derived from intended-response survey findings with visitors to other locations and from existing data on how vacationers have responded in other locations, including the Carolinas.

1. Evacuation Rates

There is no evidence that vacationers are reluctant to evacuate when a hurricane interrupts their visit to a coastal community. Based on observations of vacationer behavior in other locations and surveys in other locations concerning intended responses, it is reasonable to assume that 90% to 95% of vacationers will evacuate their accommodations if evacuation orders are issued.

2. Type of Refuge

Officials sometimes report a large number of vacationers in public shelters, but they represent a very small percentage of the total visitor population. Fewer than 5% of the evacuating vacationers will go to public shelters. Between 25% and 50% will seek inland hotels and motels. The remainder will return home or stay with friends and relatives in Florida, although the number returning home will depend on the distances traveled by tourists. Those most likely to return home live within a one-day drive of where they vacation.
3. Destinations

Up to 5% of tourist evacuees will stay within the county where their vacation accommodations were located or go to a nearby county to use a public shelter. At least half will go elsewhere in Florida to continue their vacation or wait out the storm. Up to half will return home, if they live within a one-day drive.

4. Vehicle Use

The great majority of tourists have a vehicle available to them when on vacation, often their own. Virtually all of the vehicles will be used in evacuating, either to other tourist destinations, home, or airports.

5. Evacuation Timing

Tourists leave at least as early as residents. The same curves used for residents should be used for tourists, unless officials order vacationers to evacuate earlier.

I. Planning Assumptions

Planning assumptions for evacuation behavior form the final product of behavioral analysis and are subsequently used as inputs for the transportation modeling effort. Reasonable and accurate assumptions are an important element of any modeling process. Planning assumptions for the Statewide Regional Evacuation Study Program are derived using professional analysis of statewide survey results with a cross comparison of previous behavioral analyses. Confidence levels are attached to consistent findings and known behavioral trends. Statistical anomalies that emerge from survey results are analyzed and may be disregarded to the extent that they fall outside professionally accepted behavioral norms.

An abbreviated set of planning assumptions for each of the counties in the East Central region is listed in the county appendixes to this chapter. A complete listing of the planning assumptions including the background files and methodology statement is included in Volume II.