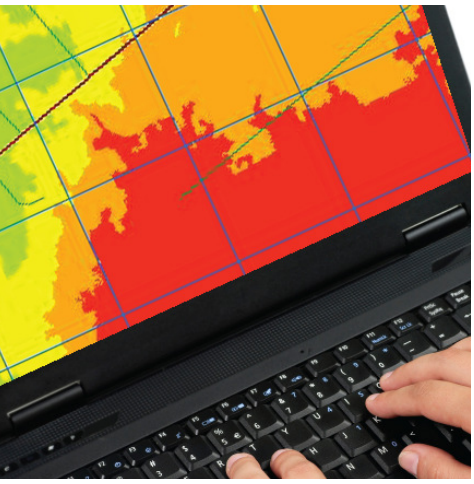
Florida Statewide Regional Evacuation Study Program

Technical Data Report



Volume 1-2

Florida Division of Emergency Management

Apalachee Regional Planning Council

Apalachee Region

Includes Hurricane Evacuation Study

Statewide Regional Evacuation Study Program

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Apalachee Bay Region Statewide Regional Evacuation Study Program

for
Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty and Wakulla Counties

Prepared by:
Apalachee Regional Planning Council
for the
Florida Department of Community Affairs
Division of Emergency Management

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CREDITS & ACKNOWLEDGEMENTS

Funding was authorized by the Florida Legislature through House Bill 7121, as a result of the 2004 and 2005 hurricane seasons. Provisions of this bill require the Florida Division of Emergency Management (FDEM) to update all Regional Evacuation Studies in the State and inexorably tied the Evacuation Studies and Growth Management. As a result, this study addresses both Emergency Management and Growth Management data needs. Funds were also provided by the Federal Emergency Management Agency (FEMA) with all money administered through the FDEM, 2555 Shumard Oak Blvd., Tallahassee, 32399. Web site: www.floridadisaster.org. Local match was provided by the Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty and Wakulla Counties.

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The Statewide Regional Evacuation Study Program was completed by regional planning council staff in all eleven regions of the State. Oversight was provided by a small group in order to facilitate an overall review of the program. Subject matter expertise was provided by section leads for the major portions of the Study. It was these leaders who ensured that the accepted methodology was used across the state and that each section was completed in a consistent manner.

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In addition, sincere thanks to all staff members, both past and present, and to FDEM, whose contribution of time, interest and knowledge have made this project a success.

The Apalachee Regional Planning Council (ARPC), (Region 2), is one of the 11 regional planning councils in Florida established under the authority of Chapter 186, Florida Statutes. It has been in operation since 1978 assisting public, private and institutional sectors in a nine-county area to address regional issues. The ARPC offers services to the following nine counties and their municipalities: Calhoun, Franklin, Gadsden, Gulf, Jackson, Jefferson, Leon, Liberty and Wakulla.

The Board of the ARPC is comprised of local government elected officials, gubernatorial representatives and Ex-Officio Members within the region.

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Statewide Regional Evacuation Study Program
List of Volumes

Volume 1 – Technical Data Report
The *Technical Data Report* (TDR) is the primary document of the Regional Evacuation Study. The TDR contains the summary analysis of all other supporting research, survey data and modeling.

Volume 2 – Regional Behavioral Analysis
The *Regional Behavioral Analysis* was produced by the behavioral specialist Dr. Earl J. Baker, Hazards Management Group. The report includes a summary of the behavioral survey data and analysis which includes the regional behavioral assumptions incorporated in the calculation of evacuation population, evacuation participation rates (transportation analaysis) and anticipated shelter demand.

Volume 3 – Regional Behavioral Analysis Report
The *Regional Behavioral Analysis Report*, produced by Kerr and Downs, Inc., provides the survey data from the more than 2,500 behavioral survey conducted in 2009 as part of the Statewide Regional Evacuation Study (SRES) Program.

Volume 4 – Evacuation Transportation Analysis
The *Regional Evacuation Analysis* was produced by the evacuation transportation team at Wilbur Smith and Associates. It includes a summary description of the evacuation transportation model, study methodologies and assumptions and growth management impacts assessments on evacuation. The report includes the evacuation clearance times for the counties and the region for 2010 and 2015 under different planning and operational scenarios.

Volume 5 – Evacuation Transportation Supplemental Data Report
This report, prepared by Wilbur Smith and Associates, contains the model run inputs and outputs and serves as the source of data for the *Evacuation Transportation Analysis*.

Volume 6 – Emergency Management Evacuation Tool Kit
The Tool Kit includes locally selected data pertinent to the county emergency management agency. It is meant to be used as a quick reference guide for operations.

Volume 7 – Storm Tide Atlas
The *Storm Tide Atlas* provides the storm tide boundaries based on the new SLOSH analysis including the boundaries of the Coastal High Hazard Area. It is provided in several formats including GIS files, PDF files and printed copy. There is one book for each county in the region which has a potential to experience storm tide flooding.

Volume 8 – Methodology of Evacuation Transportation Modeling for the SRES Program, 2010
This volume provides detailed descriptions of the methodologies, model assumptions and the Transportation Interface for Modeling Evacuations (TIME) developed and used in the SRES Program.

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Technical Data Report
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Preface

A. About the Region

The Apalachee Bay Region is best known for its unique blue water springs, the state capitol, two major public universities and pristine white sand beaches. Spanning 6,757 sq. miles, with a land area of 5,805 square miles, the region encompasses nine counties, four of which lie on the Gulf Coast. Over 30 percent of the land mass is held in public ownership or conservation easement. Home to the Apalachicola Bay Estuary, one of the most productive estuaries in the world, the communities in the Apalachee Bay Region thrive on its local festivals and events. The state capitol in Tallahassee drives a significant portion of the region's economy with every county in the region contributing to its labor force. Outside of Leon County, the seafood industry in the coastal counties and agriculture and the developing distribution industry in the northern counties serve as main employers. The region is actively pursuing ecotourism development and is home to the Florida State Seminoles and the FAMU Rattlers. Over 100,000 fans gather in Tallahassee for seven weekends every fall to participate and enjoy one of the region's favorite past times – football.

While the Apalachee Bay Region has not experienced the explosive growth seen in the southern and central parts of the state, it has also been somewhat insulated from the recent downturn in the global economy. With just under half a million in regional population, the rural communities of the region enjoy the quieter lifestyle once common in "Old Florida". Two of the nine counties have experienced a loss in population over the last 10 years; however three counties continue to have stable moderate growth.

B. Background

The most recent Regional Hurricane Evacuation Study for the Apalachee Bay Region was conducted in 1997 by the U.S. Army Corps of Engineers. A Transportation Analysis Update was completed in 2004 by PBSJ. The Statewide Regional Evacuation Study Program, which commenced in 2006, accounts for population growth and land use changes that have occurred since the last study in 1997. This study is a first time effort in creating a statewide standardized study and methodology across Florida. In addition to focusing on hurricane hazards and evacuation, the study addresses issues concerning other hazards which may

warrant an evacuation, thus affecting the region. Other hazards addressed are tornadoes, freshwater flooding, and wildfires. Using the most up to shelter and state critical facility data, population data, transportation data and new behavioral survey data, the Statewide Regional Evacuation Study for the Bay Region will replace the study from 1997 and the transportation analysis from 2004 and will be used in not only emergency management planning, but transportation and land use planning as well.

C. Objective and Scope

A major hurricane making landfall reaches beyond county lines and effects even areas not directly hit by the storm. Jurisdictions and counties can share one bay or estuary which can experience drastic storm surge. Evacuation routes can bring residents from one town or county into a completely different jurisdiction or even state. Therefore, it is important for local governments to communicate across governmental lines in order to plan for the potential impacts neighboring jurisdictions may have on safely evacuating the threatened population.

The primary purpose of this study was to coordinate a statewide, regionally consistent, comprehensive and quantitative evacuation study, primarily for hurricanes. The major components of the study consisted of the following:

- Hazards Analysis - A comprehensive analysis of potential hurricane hazards in the East Central Florida Region utilizing the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model and new topographic data, Light Detection and Ranging (LiDAR).

- Vulnerability Analysis – Identification of the vulnerable areas and population to hurricane, wind and flooding hazards.

- Demographic and Land Use Analysis – Describe population and demographics for the region and counties using current socioeconomic data for 2006, 2010 and 2015.

- Behavioral Analysis – A survey and analysis to determine how vulnerable evacuees may respond to a hurricane threat as well as other hazards.

- Shelter Analysis – A quantitative analysis of shelter availability, deficit, and special needs (medical and pets).

- Transportation Analysis – Development of hurricane evacuation clearance times for each county and storm scenario associated with the movement of the current and projected vulnerable population from specific evacuation areas to specific evacuation destinations for a Year 2006 base year and projected for years 2010 and 2015.

- Ensure consistency in evacuating population and routes with adjacent regions.

- Update and standardize the DEM facilities database to provide all counties with consistent, accurate and standardized emergency management data.

- Establish standardized analysis and methodology for use in deriving impacts and determining mitigation needs as required in F.S. 163.3178.

As a result of this study, an abbreviated model called "TIME" was developed that can be used by local emergency management officials, city and county planning staff, state emergency preparedness officials, and others to recalculate clearance times based upon land use and transportation system changes.

The *Apalachee Bay Regional Evacuation Study* is not intended to serve as the detailed operations plan for each unit of local government in the region. It is intended to provide the data needed to develop local, regional and state plans. The implementation of any evacuation plan is a local function. Therefore, the actual deployment and assignment of manpower and equipment to carry out the evacuation is best planned for at the local level. The data provided in this report will assist local governments of the region to update specific operating procedures for emergency events requiring the evacuation and relocation of its citizens.

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Volume 1-2
Apalachee Bay Region
Technical Data Report

Executive Summary

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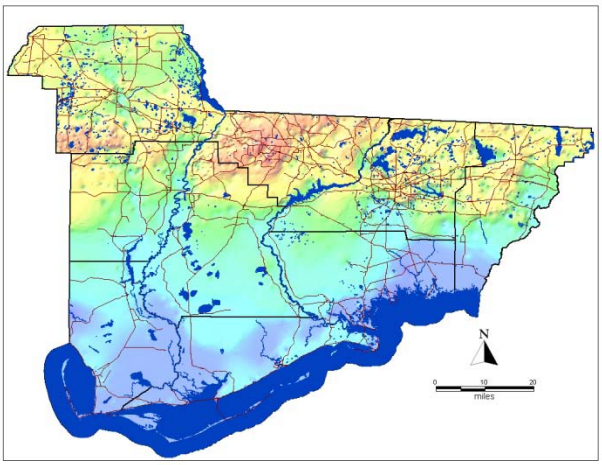
EXECUTIVE SUMMARY

This Executive Summary is provided to state and local governments, volunteer organizations, the media and interested residents to highlight the results of the *Statewide Regional Evacuation Study for the Apalachee Bay Region* (SRES) and to quantify and to illustrate the challenges of evacuation response in the Tampa Bay Region.

A. Demographic and Land Use Analysis

Located on the Gulf coast of Florida, the Apalachee Bay Region is approximately 6,757 square miles (land area) with an additional 952 square miles of water area and is favored with nearly 700 miles of shoreline (including inlets) and 900 miles of coastline.



The region consists of nine counties, four coastal and five inland counties. Franklin, Gulf, Jefferson and Wakulla are the four coastal counties and Calhoun, Gadsden, Jackson, Leon and Liberty are the five inland counties. It is bounded on west by Holmes, Washington and Bay counties, on the north by Georgia and Alabama, to the east by Madison and Taylor counties and to the south by the Gulf of Mexico. Leon County has the largest population in the region and serves as the hub for regional resources. Over half of the population lives inland in Gadsden, Jackson and Leon Counties and these communities had experienced a moderate growth rate until the economic downturn.

Chapter I provides a demographic profile of the region and the counties themselves. Specific socio-economic characteristics that may have an impact on evacuation vulnerability, response and mass care were identified using Census data. Information includes:

- Overall Population
- Group Quarters Population
- Housing Units by Type
- Occupied Housing Units (Households)
- Household Size
- Seasonal Dwelling Units
- Vehicles per Household
- Age Composition
- Race / Ethnicity
- Place of Birth and Citizenship
- Linguistic Isolation
- Labor Force
- Poverty Status
- Small Area Dwelling Unit and Population Data (TAZ)

The Apalachee Bay Region Future Land Use Map is presented on Map I-3. There are 11 categories identified which represent a consolidation of land use categories identified in the local government comprehensive plans in the region (See Table I-17).

- RL Residential Lo (higher than AG < 1DU)
- RH Residential High (more than RM and > 12DU)
- RM Residential Medium (more than RL, < 13DU)
- CONS Conservation, natural and protected
- PUB Public/Semi-Public, government, institutional
- AG Agriculture - rural land, farms (< 0.5DU)
- REC Recreation/Open Space
- COM Commercial, office, tourism, marina
- MU Mixed Use, activity centers, urban village
- WAT Water bodies
- IND Industrial, extractive, transportation

B. Regional Hazards Analysis

The Hazards Analyses is the first step in the development of the regional evacuation study. The Hazards Analysis identifies type, extent and probability of those hazards which may confront our region and necessitate a regional evacuation. The SRES took an "all-hazards" approach to this evacuation study. The hazards which could necessitate an evacuation at a regional level were identified as (1) tropical storms and hurricanes, (2) freshwater flooding, (3) hazardous materials and (4) wildfire.

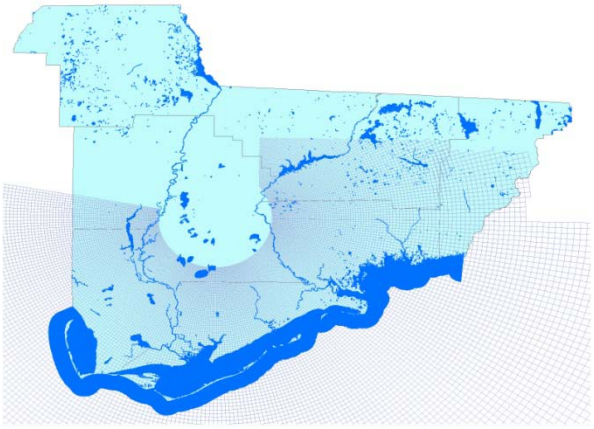
1. Tropical Storms and Hurricanes

Risks from tropical storms and hurricanes include storm surge, high winds, tornadoes and inland flooding. Storm surge, considered the most deadly hazard, was quantified using the National Oceanic and Atmospheric Administration (NOAA) numerical storm surge model, SLOSH[1]. The SLOSH modeling system consists of the model source code and model basin or grid. SLOSH model grids must be developed for each specific geographic coastal area individually incorporating the unique local bay and river configuration, water depths, bridges, roads and other physical features. In addition to open coastline heights, one of the most valuable outputs of the SLOSH model for evacuation planning is its predictions of surge heights over land which predicts the degree of propagation of the surge into inland areas.

SLOSH provides the maximum amount of surge expected at approximately 3500 points in the region considering different parameters of 12,000 hypothetical storms (strength, track, size and forward speed) and the topography and the bathymetry of the Apalachee Bay basin.

[1]SLOSH stands for Sea, Lake and Overland Surges from Hurricanes

The newest generation of the SLOSH model basin incorporated in the 2010 SRES, reflects major improvements, including higher resolution basin data and grid configurations. Faster computer speeds allowed additional hypothetical storms to be run for creation of the MOMs (maximum potential storm surge) values for each category of storm. Storm tracks were run in ten different directions and for each set of tracks in a specific direction, storms were run at forward speeds of 5, 10, 15 and 25 mph. For each direction, at each speed, storms were run at two different sizes, 20 statute mile radius of maximum winds and 35 statute miles radius of maximum winds. Finally, each scenario was run at both mean tide and high tide. Both tide levels are now referenced to North American Vertical Datum of 1988 (NAVD88) as opposed to the National Geodetic Vertical Datum of 1929 (NGVD29).



SLOSH and SLOSH related products reference storm surge heights relative to the model vertical datum, in this case NAVD88. In order to determine the inundation depth of surge flooding at a particular location the ground elevation at that location must be subtracted from the potential surge height. As part of the SRES, all coastal areas as well as areas surrounding Lake Okeechobee were mapped using remote-sensing laser terrain mapping (LIDAR[2]) providing the most comprehensive, accurate and precise topographic data for this analysis. As a general rule, the vertical accuracy of the laser mapping is within a 15 centimeter tolerance.

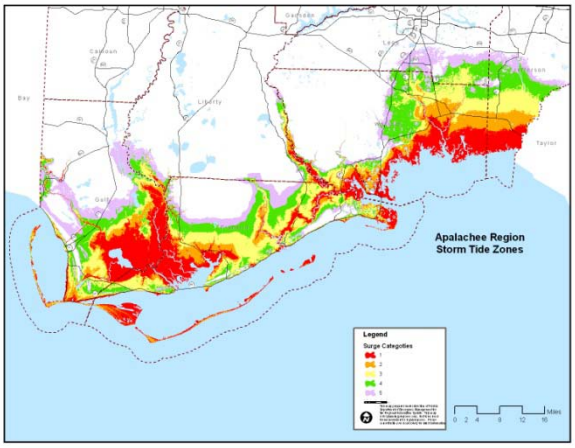
The LIDAR data was incorporated into the SLOSH basin data and used to subtract the land elevation from the storm surge height to develop the storm tide limits. The result of this storm surge hazard analysis is graphically portrayed in the Storm Tide Atlas which illustrates the storm tide limits based on the maximum storm surge for landfalling categories 1, 2, 3, 4 and 5.

While all residents would be susceptible to some extent from the affects of hurricane-force winds, mobile home residents are far more vulnerable than residents in site-built homes. Mobile home and RV Park data was updated using information from the State of Florida Department of Health.

Tornadoes are another hazard of tropical storm activity. Because it is impossible to identify where a tornado imbedded in the hurricane wind bands will strike, it is difficult to issue evacuations for tornado activity. It is recognized, however, that mobile home residents are much more vulnerable to this severe weather event. Therefore, with the evacuation of mobile homes for hurricane winds, it is anticipated that severe injury will also be reduced from any tornado activity. In addition, the public information campaign

[2] Light Imaging Detection and Ranging

will include a recommendation that tornado safe rooms (see www.fema.gov) be considered by residents.



While inland flooding had not been considered to be life-threatening in the past, it has, over the last twenty years, become a leading cause of hurricane-related deaths until Hurricane Katrina in 2005. The 100-year flood zone, as designated by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP), is identified and addressed separately under the Flooding Hazard.

Florida counties do not typically evacuate for inland flooding for a hurricane, it is recognized that this may become a major problem during a hurricane evacuation, after a tropical storm passes or after prolonged rainfall. Evacuation routes within the flood zone are identified in an effort to find alternative routes, if necessary.

2. Flooding

Both coastal and inland flooding are addressed through FEMA's NFIP. The 100-year floodplain was identified within the region to illustrate the regional and county-level vulnerability to the flood hazard. In addition, communities with repetitive loss properties have been identified by building type to provide an overall assessment of the risk. The areas' risk, historical frequency and estimated population at risk were identified in the hazards and vulnerability analyses. Also identified were dams which could pose a risk to the population which lives below them.

3. Wildfires and the Urban Interface

Florida is home to millions of residents who enjoy the state's beautiful scenery and warm climate. But few people realize that these qualities also create severe wildfire conditions. Each year, thousands of acres of wildland and many homes are destroyed by fires that can erupt at any time of the year from a variety of causes, including arson, lightning and debris burning. Adding to the fire hazard is the growing number of people living in new communities built in areas that were once wildland. This growth places even greater pressure on the state's wildland firefighters. As a result of this growth, fire protection becomes everyone's responsibility.

A wildfire is any fire occurring in the wildlands (i.e., grasslands, forest, brushland, etc).

Wildfires have burned across the woodlands of Florida for centuries and are part of the natural management of much of Florida's ecosystems. (*Statewide Hazard Mitigation Plan*, 2007)

The risk of potential wildfire to the region's population was identified using the data provided by the Florida Division of Forestry (FlamMap) and the population living in the high/very high risk areas was estimated.

4. Hazardous Materials

A hazardous material is generally considered as any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals or the environment, either by itself or through interaction with other factors. Almost every community deals with hazardous materials on a daily basis through transport, use, storage and/or disposal. Although major chemical emergencies are extremely rare, there always remains a chance that one will occur. In the State of Florida, the county emergency management agency maintains plans for hazardous material incidents and coordinates regionally for response through the Local Emergency Planning Committees (LEPCs). While the facilities with extremely hazardous materials were identified, the evacuation planning for incidents involving hazardous materials is addressed in the *Regional Hazardous Material Emergency Response Plan.*

No specific emergency sequence can be isolated as the model for which to plan because each emergency could have different consequences, both in nature and degree. As an alternative to defining a specified emergency, the regional plan identifies various parameters for planning which are based upon knowledge of the possible consequences, timing, and release characteristics of a spectrum of emergencies. The *Regional Hazardous Materials Emergency Response Plan* then establishes the appropriate response for each level of threat. Therefore, the Statewide Regional Evacuation Study did not specifically address hazardous material incidents.

C. Vulnerability and Population Analysis

Depending upon the strength of the storm, the regional evacuation study calls for the complete evacuation of successively more surge-vulnerable zones inland in addition to all mobile home residents. Using information from the Metropolitan Planning Organizations (MPOs) and the local planning commissions/departments, the population, dwelling unit counts and vehicle data for each zone was developed (see Chapter IV, Regional Vulnerability and Population Analysis). County and regional population-at-risk for the years 2010 and 2015 are presented in Tables ES-1 and ES-2 below.

Table ES-1
Population-at-Risk from Hurricanes by Evacuation Level, 2010

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D
Franklin County				
Site-built Homes	2,579	6,751	N/A	N/A
Mobile/Manuf. Homes	503	2,276	N/A	N/A
TOTAL	3,082	9,027	N/A	N/A
Gulf County				
Site-built Homes	1,455	5,385	801	N/A
Mobile/Manuf. Homes	223	828	426	N/A
TOTAL	1,678	6,213	1,226	N/A
Jefferson County				
Site-built Homes	0	0	21	163
Mobile/Manuf. Homes	0	0	0	0
TOTAL	0	0	21	163
Leon County				
Site-built Homes	0	0	264	2,950
Mobile/Manuf. Homes	0	0	284	3,784
TOTAL	0	0	548	6,734
Wakulla County				
Site-built Homes	5,978	10,655	8,638	N/A
Mobile/Manuf. Homes	1,975	3,140	3,777	N/A
TOTAL	7,952	13,796	12,416	N/A

Note: Vulnerable population determined using SRESP behavioral data and county provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.

Table ES-2
Population-at-Risk from Hurricanes by Evacuation Level, 2015

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D
Franklin County				
Site-built Homes	2,644	6,921	N/A	N/A
Mobile/Manuf. Homes	504	2,280	N/A	N/A
TOTAL	3,148	9,201	N/A	N/A
Gulf County				
Site-built Homes	1,576	5,835	867	N/A
Mobile/Manuf. Homes	241	897	462	N/A
TOTAL	1,817	6,732	1,329	N/A
Jefferson County				
Site-built Homes	0	0	21	161
Mobile/Manuf. Homes	0	0	0	0
TOTAL	0	0	21	161
Leon County				
Site-built Homes	0	0	275	3,076
Mobile/Manuf. Homes	0	0	296	3,945
TOTAL	0	0	571	7,020
Wakulla County				
Site-built Homes	6,722	11,984	9,715	N/A
Mobile/Manuf. Homes	2,222	3,532	4,248	N/A
TOTAL	8,944	15,516	13,963	N/A

Note: Vulnerable population determined using SRESP behavioral data and county provided evacuation zones. Population-at-risk numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include the population-at-risk listed for Evacuation Zone A.

If everyone who was ordered to evacuate did so and those who were not ordered to evacuate, secured their homes and stayed put, emergency management could use the population-at-risk statistics. This, however, is not the case.

Post-hurricane behavioral studies conducted along the Atlantic and Gulf coasts illustrate that many people ordered to evacuate will not and, conversely, people who live in site-built homes far outside the coastal areas will pack up and try to "outrun" the storm (*"shadow evacuation"*). How we quantify this behavior is key to an accurate transportation analysis. This study used the general response model (HMG, 2010) as well as the surveys conducted in 2009 (see Chapter III, Regional Behavioral Analysis Summary). Volume 2 of the SRES provides the Regional Behavioral Assumptions based upon the General Response Model and the survey results presented in Volume 3, Behavioral Survey Report.

Using the behavioral assumptions discussed in Chapter III, two scenarios were developed. The base scenario population scenario assumes that 100% of the population-at-risk evacuate plus the anticipated "shadow evacuation" from outside the surge vulnerable areas. This scenario is considered the most "conservative" estimate and will be used for growth management

purposes. Tables ES-3 and ES-4 present these evacuation population estimates for 2010 and 2015.

Table ES-3
Evacuating Population by Base Planning Scenario 2010

	Category 1	Category 2	Category 3	Category 4	Category 5
Calhoun County	4,909	5,472	6,597	7,160	7,723
Franklin County	8,191	13,171	13,171	13,171	13,171
Gadsden County	11,688	13,048	14,408	15,768	17,129
Gulf County	6,790	10,523	10,912	11,745	11,879
Jackson County	7,724	8,894	11,235	12,405	13,575
Jefferson County	2,607	2,895	3,201	3,544	3,921
Leon County	24,974	33,679	51,211	60,960	71,263
Liberty County	1,522	1,655	1,907	2,037	2,174
Wakulla County	20,370	27,917	30,098	34,865	34,889

Table ES-4
Evacuating Population by Base Planning Scenario for 2015

	Category 1	Category 2	Category 3	Category 4	Category 5
Calhoun County	4,881	5,441	6,560	7,119	7,678
Franklin County	8,319	13,416	13,416	13,416	13,416
Gadsden County	12,238	13,661	15,084	16,506	17,929
Gulf County	7,359	11,391	11,813	12,716	12,861
Jackson County	8,052	9,272	11,713	12,934	14,154
Jefferson County	2,569	2,853	3,155	3,493	3,864
Leon County	26,034	35,103	53,368	63,526	74,261
Liberty County	1,5222	1,655	1,907	2,037	2,174
Wakulla County	22,897	31,349	33,801	39,162	39,189

The operational scenario population estimates apply the participation rates presented in the regional behavioral assumptions. They do not assume that 100% of the population at risk evacuate but do include the "shadow evacuation" expected depending on the strength of the hurricane. Tables ES-5 and ES-6 present the evacuation population estimates and projections for 2010 and 2015.

Table ES-1
Evacuating Population by Operational Planning Scenario for 2010

	Category 1	Category 2	Category 3	Category 4	Category 5
Calhoun County	2,736	3,516	5,076	5,076	6,074
Franklin County	6,143	7,718	9,621	10.803	11,916
Gadsden County	7,204	9,012	11,717	11,717	13,974
Gulf County	4,744	5,616	8,612	9,622	10,800
Jackson County	4,447	4,447	5,945	9,269	9,269
Jefferson County	1,698	3,192	3,192	3,243	3,761
Leon County	16,923	26,363	46,163	57,353	67,909
Liberty County	798	989	1,437	1,437	1,695
Wakulla County	14,040	16,485	22,678	28,718	31,778

Table ES-6
Evacuating Population by Operational Planning Scenarios for 2015

	Category 1	Category 2	Category 3	Category 4	Category 5
Calhoun County	2,720	3,496	5,048	5,048	6,039
Franklin County	6,244	7,841	9,789	10,998	12,130
Gadsden County	7,542	9,434	12,266	12,266	14,628
Gulf County	5,139	6,069	9,319	10,414	11,691
Jackson County	4,637	4,637	6,198	9,664	9,664
Jefferson County	1,673	3,146	3,146	3,197	3,707
Leon County	17,642	27,479	48,115	59,780	70,781
Liberty County	798	989	1,437	1,437	1,695
Wakulla County	15,776	18,489	25,454	32,247	35,689

Chapter IV also presents the vulnerability of critical facilities within the region to (1) tropical storms and hurricanes; (2) flooding (100-year and 500-year); and wildfire (high and very high). The County Appendices provide more detailed data and maps for selected critical facilities including health care facilities (hospitals, nursing homes, etc.), assisted living facilities, fire and police stations and other identified facilities.

D. Public Shelter Demand

As part of the regional evacuation study, the anticipated demand for public shelter was quantified. The public shelter inventories and the capacities within each county were identified and a comparison was made to determine the status within both the county and the region.

The general response model, post-hurricane behavioral surveys of residents in the Apalachee Bay Region and past experience was used to determine public shelter demand. The number of evacuees who choose public shelter as their evacuation destination is based on demographic characteristics of the population including income and age, risk area and housing (mobile home vs. site built homes). The planning assumptions regarding anticipated shelter use were presented in the Regional Behavioral Analysis (See Chapter III, Appendices), and were applied to the projected Hurricane Evacuation Population estimates for both the base planning scenarios as well as the operational scenarios.

The base planning scenarios assume 100% compliance of the populations-at-risk (surge-vulnerable and mobile home residents) plus the "shadow evacuation". The operational scenarios use the participation rates from the behavioral analysis to determine the evacuation rates.

Table ES-7
Public Shelter Demand by Base Scenario 2010

Category of Storm	Calhoun**	Franklin*	Gadsden	Gulf*	Jackson	Jefferson*	Leon*	Liberty	Wakulla*
Capacity	**0**	**0**	**3,834**	**460**	**1,564**	**809**	**5,100**	**1,150**	**700**
1	779	413	1,793	420	427	305	1,793	257	932
2	855	673	2,068	609	585	331	2,237	274	1,301
3	1,008	673	2,346	638	901	357	3,127	309	1,408
4	1,084	673	2,621	710	1,058	387	3,619	327	1,639
5	1,160	676	2,899	720	1,217	420	4,138	344	1,641

*Indicates a county which has the potential to experience storm surge.
**Calhoun County is scheduled to open a shelter in 2011.

Table ES-8
Public Shelter Demand by Base Scenario 2015

Category of Storm	Calhoun**	Franklin*	Gadsden	Gulf*	Jackson	Jefferson*	Leon*	Liberty	Wakulla*
Capacity	**0**	**0**	**3,834**	**460**	**1,564**	**809**	**5,100**	**1,150**	**700**
1	775	418	1,876	455	446	300	1,870	257	1,047
2	851	685	2,166	659	609	326	2,329	274	1,462
3	1,003	685	2,455	692	938	350	3,256	309	1,582
4	1,079	685	2,745	770	1,104	381	3,770	327	1,843
5	1,154	685	3,034	779	1,269	414	4,312	344	1,843

*Indicates a county which has the potential to experience storm surge.
**Calhoun County is scheduled to open a shelter in 2011.

Table ES-9
Public Shelter Demand by Operational Scenario 2010

Category of Storm	Calhoun**	Franklin*	Gadsden	Gulf*	Jackson	Jefferson*	Leon*	Liberty	Wakulla*
Capacity	**0**	**0**	**3,834**	**460**	**1,564**	**809**	**5,100**	**1,150**	**700**
1	427	315	1,171	287	292	194	1,119	137	648
2	538	383	1,511	335	292	344	1,622	167	760
3	762	481	1,971	509	464	344	2,701	237	1,064
4	762	529	1,972	577	1820	350	3,317	237	1,349
5	908	605	2,374	653	820	403	3,881	279	1,491

*Indicates a county which has the potential to experience storm surge.
**Calhoun County is scheduled to open a shelter in 2011.

Table ES-10
Public Shelter Demand by Operational Scenario 2015

Category of Storm	Calhoun**	Franklin*	Gadsden	Gulf*	Jackson	Jefferson*	Leon*	Liberty	Wakulla*
Capacity	**0**	**0**	**3,834**	**460**	**1,564**	**809**	**5,100**	**1,150**	**700**
1	426	320	1,228	311	305	191	1,166	137	729
2	537	389	1,582	363	305	339	1,691	167	853
3	759	488	2,066	549	483	339	2,814	237	1,193
4	759	538	2,066	625	855	344	3,456	237	1,515
5	905	614	2,485	709	855	396	4,044	279	1,676

*Indicates a county which has the potential to experience storm surge.
**Calhoun County is scheduled to open a shelter in 2011.

Using the behavioral assumptions based on the General Response Model has a significant impact on the potential shelter demand calculations. As noted in Chapter III, Regional Behavioral Analysis, the use of public shelters for residents in site built homes ranges from 5% - 10% depending on age and income. Traditionally, a public shelter use rate of between 10%-25% was used for planning purposes. However, the trend for less reliance on public shelters has been recognized in past evacuations throughout the Gulf and Atlantic states.

Recognizing the trend toward a reduced reliance on public shelters, there remains a concern that the assumption of such a drastic reduction in anticipated need does not take into consideration that many vulnerable residents will choose not to evacuate until there is no longer sufficient time to reach other destinations. This could logically result in a surge of evacuees to the public shelters in the closing hours of the evacuation. In addition if a major hurricane were to impact the region, there would be less capacity in public shelters for those residents who have no home to which to return.

In terms of community resiliency, without the requirement of EHPA standards, new schools may not be built to standards which would insure the schools would survive the hit of major hurricane. In addition the need for more special needs shelters must also be addressed in both State and local plans. Therefore, local emergency management may use different assumptions for both public and special needs shelters within the operational plans as reflected in the County Comprehensive Emergency Management Plans (CEMPs).

E. Evacuation Transportation Analysis

The evacuation transportation analysis discussed in Chapter VI of this Volume, documents the methodology, analysis, and results of the transportation component of the SRES. Among the many analyses required for the SRES, transportation analysis is probably one of the most important components in the process. By bringing together storm intensity, transportation network, shelters, and evacuation population, transportation analysis explicitly links people's behavioral responses to the regional evacuation infrastructure and helps formulate effective and responsive evacuation policy options. Due to the complex calculations involved and numerous evacuation scenarios that need to be evaluated, the best way to conduct the transportation

analysis is through the use of computerized transportation simulation programs, or transportation models.

The development of the transportation methodology and framework required coordination and input from all eleven regional planning councils in Florida, along with the Division of Emergency Management, Department of Transportation, Department of Community Affairs, and local county emergency management teams. At the statewide level, the transportation consultant, Wilbur Smith Associates, participated in SRES Work Group Meetings which were typically held on a monthly basis to discuss the development of the transportation methodology and receive feedback and input from the State agencies and RPCs.

At the local and regional level, Wilbur Smith Associates conducted a series of four regional meetings to coordinate with and receive input from local county emergency management, the regional planning council, local transportation planning agencies and groups, as well as other interested agencies.

1. Transportation Methodology

The methodology used in the Apalachee Bay Region Evacuation Transportation Analysis is identical to the methodology used for all eleven RPCs and includes the following components:

- Behavioral Assumptions
- Zone System and Highway Network
- Background Traffic
- Evacuation Traffic
- Dynamic Traffic Assignment

The regional model developed for the Apalachee Bay Region used a series of input data provided by the RPC, including the following:

- Regional Model Network
- Regional Zone System
- Regional Demographic Characteristics

2. Clearance Times

Based on the analysis, the Clearance Times for the base planning and operational scenarios for 2010 and 2015 are provided below.

- **Clearance Time to Shelter:** The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point in time when the evacuation order is given to the point in time when the last vehicle reaches a point of safety within the county.
- **In-County Clearance Time:** The time required from the point an evacuation order is given until the last evacuee can either leave the evacuation zone or arrive at safe shelter

within the County. This does not include those evacuees leaving the County, on their own.

- **Out of County Clearance Time:** The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point an evacuation order is given to the point in time when the last vehicle assigned an external destination exits the county.
- **Regional Clearance Time**: The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the RPC region based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point in time when the evacuation order is given to the point in time when the last vehicle assigned an external destination exits the region.

Table ES-11
2010 Clearance Times for Base Planning Scenario

	Category 1	Category 2	Category 3	Category 4	Category 5
Clearance Time to Shelter					
Calhoun County	3.0	3.5	4.0	4.5	5.0
Franklin County	10.5	0.5	0.5	0.5	0.5
Gadsden County	11.5	12.0	12.0	12.0	12.5
Gulf County	9.5	11.5	12.0	12.0	12.0
Jackson County	10.5	10.5	12.0	11.5	11.0
Jefferson County	3.5	4.0	7.0	6.5	8.5
Leon County	12.0	12.5	12.5	12.5	12.5
Liberty County	0.5	0.5	0.5	0.5	2.5
Wakulla County	11.0	12.5	12.5	10.0	10.5
In-County Clearance Time					
Calhoun County	9.0	10.5	10.5	10.0	10.5
Franklin County	13.0	13.5	13.5	14.0	13.5
Gadsden County	13.0	13.0	13.0	13.0	13.0
Gulf County	12.0	12.5	12.5	13.0	12.5
Jackson County	12.5	12.5	13.0	12.5	12.5
Jefferson County	10.0	12.5	11.5	12.0	12.0
Leon County	13.0	13.0	13.0	13.5	14.0
Liberty County	0.5	12.5	12.5	11.0	11.0
Wakulla County	13.5	13.5	13.5	14.0	14.0
Out of County Clearance Time					
Calhoun County	13.0	13.0	13.0	13.0	13.5
Franklin County	13.0	13.0	13.0	13.5	13.0
Gadsden County	13.5	14.0	14.5	14.5	14.5
Gulf County	12.0	13.0	12.5	13.0	13.0
Jackson County	14.0	14.0	14.0	14.0	14.0
Jefferson County	14.0	14.0	14.5	14.5	14.5
Leon County	14.5	14.5	15.0	14.5	14.5
Liberty County	12.5	13.0	13.5	13.5	13.0
Wakulla County	13.5	14.0	14.0	14.0	14.0
Regional Clearance Time					
Apalachee	14.5	14.5	15.0	14.5	14.5

Table ES-12
2015 Clearance Times for Base Planning Scenario

	Category 1	Category 2	Category 3	Category 4	Category 5
Clearance Time to Shelter					
Calhoun County	4.0	3.5	2.0	2.5	5.5
Franklin County	11.0	0.5	0.5	0.5	0.5
Gadsden County	12.0	12.0	12.0	12.5	12.5
Gulf County	9.0	12.0	12.0	12.0	11.5
Jackson County	10.5	11.0	11.5	11.0	11.0
Jefferson County	3.5	6.0	7.0	6.5	7.0
Leon County	12.5	12.5	12.5	12.5	12.5
Liberty County	0.5	0.5	0.5	0.5	0.5
Wakulla County	12.0	12.5	12.5	11.0	10.5
In-County Clearance Time					
Calhoun County	10.5	10.5	8.5	8.5	10.5
Franklin County	13.0	13.5	13.5	14.0	13.5
Gadsden County	13.0	13.0	13.0	13.0	13.0
Gulf County	11.5	12.0	12.5	13.0	13.0
Jackson County	12.5	12.5	12.5	12.5	12.5
Jefferson County	10.5	11.5	11.5	12.0	12.0
Leon County	13.0	13.0	13.0	14.0	14.0
Liberty County	0.5	12.5	11.0	11.0	11.0
Wakulla County	13.5	13.5	13.5	14.0	14.0
Out of County Clearance Time					
Calhoun County	13.0	13.0	13.0	13.0	13.5
Franklin County	13.0	13.0	13.0	13.5	13.0
Gadsden County	13.5	14.0	14.5	14.5	14.5
Gulf County	12.5	12.5	13.0	13.0	13.0
Jackson County	14.0	14.0	14.0	14.0	14.0
Jefferson County	13.5	14.0	14.5	14.5	14.5
Leon County	14.5	14.5	14.5	14.5	14.5
Liberty County	12.5	13.0	13.0	13.5	13.5
Wakulla County	13.5	14.0	14.0	14.0	14.0
Regional Clearance Time					
Apalachee	14.5	14.5	14.5	14.5	14.5

Table ES-13
2010 Clearance Times for Operational Scenarios

	Category 1	Category 2	Category 3	Category 4	Category 5
Clearance Time to Shelter					
Calhoun County	0.5	1.0	2.0	2.0	5.5
Franklin County	8.0	0.0	0.0	0.0	0.0
Gadsden County	9.0	9.5	9.5	9.5	9.5
Gulf County	6.0	9.0	9.5	9.5	6.5
Jackson County	8.0	8.0	8.5	9.0	9.0
Jefferson County	2.5	6.5	5.5	6.5	7.0
Leon County	9.0	9.5	9.5	9.5	9.5
Liberty County	0.0	0.0	0.0	0.0	0.0
Wakulla County	9.0	9.5	9.5	9.0	6.5
In-County Clearance Time					
Calhoun County	0.5	5.5	5.5	5.5	8.5
Franklin County	10.0	10.5	10.5	10.5	8.0
Gadsden County	9.5	10.0	10.0	10.0	10.0
Gulf County	9.5	9.5	9.5	10.0	7.0
Jackson County	9.0	9.0	9.5	10.0	10.0
Jefferson County	8.0	8.0	10.0	9.5	8.5
Leon County	9.5	10.0	10.0	10.5	9.5
Liberty County	0.5	8.5	8.0	9.0	6.0
Wakulla County	10.5	10.5	10.5	11.0	8.0
Out of County Clearance Time					
Calhoun County	10.0	10.0	10.5	10.0	10.5
Franklin County	10.0	10.0	10.0	10.0	7.5
Gadsden County	11.0	11.5	11.5	11.0	11.0
Gulf County	10.0	10.0	10.0	10.0	9.0
Jackson County	11.0	11.0	11.0	11.0	10.5
Jefferson County	10.5	11.5	12.0	11.5	12.0
Leon County	11.5	11.5	11.5	11.5	11.5
Liberty County	10.0	10.0	10.5	10.5	10.5
Wakulla County	10.5	10.5	11.0	11.0	8.0
Regional Clearance Time					
Apalachee	11.5	11.5	12.0	11.5	12.0

Table ES-14
2015 Clearance Times for Operational Scenarios

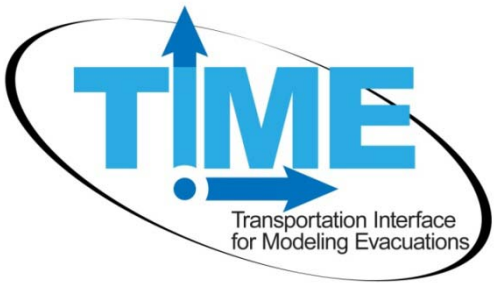
	Category 1	Category 2	Category 3	Category 4	Category 5
Clearance Time to Shelter					
Calhoun County	0.5	1.5	2.0	2.0	5.0
Franklin County	8.5	0.5	0.5	0.5	0.5
Gadsden County	9.5	9.0	9.5	9.5	9.5
Gulf County	5.5	8.5	9.5	9.5	6.5
Jackson County	7.5	6.0	8.0	9.0	9.5
Jefferson County	2.0	4.5	5.5	6.5	6.0
Leon County	9.0	9.5	9.5	9.5	9.5
Liberty County	0.0	0.0	1.0	0.5	1.0
Wakulla County	9.5	9.5	9.5	8.5	7.5
In-County Clearance Time					
Calhoun County	0.5	5.5	5.5	5.5	8.5
Franklin County	10.0	10.5	10.5	11.0	7.5
Gadsden County	10.0	9.5	10.0	10.0	10.0
Gulf County	9.5	9.5	9.5	9.5	7.0
Jackson County	9.0	9.0	9.0	10.0	10.0
Jefferson County	7.0	8.0	10.0	10.0	8.0
Leon County	9.5	10.0	10.0	11.0	9.5
Liberty County	0.5	8.5	8.5	9.0	6.0
Wakulla County	10.5	10.5	11.0	11.0	8.0
Out of County Clearance Time					
Calhoun County	10.0	10.0	10.0	10.0	10.5
Franklin County	10.0	10.0	10.0	10.5	7.0
Gadsden County	11.0	11.0	11.5	11.0	11.0
Gulf County	10.0	9.5	10.0	10.0	8.5
Jackson County	11.0	11.0	11.0	11.5	11.5
Jefferson County	11.0	11.5	12.0	12.0	11.5
Leon County	11.5	11.5	11.5	11.5	11.5
Liberty County	10.0	10.5	10.5	11.0	10.5
Wakulla County	10.5	10.5	11.0	11.0	8.0
Regional Clearance Time					
Apalachee	11.5	11.5	12.0	12.0	11.5

3. TIME User Interface

Wilbur Smith Associates developed the Transportation Interface for Modeling Evacuations (TIME) to make it easier for RPC staff and transportation planners to use the model and implement the evacuation methodology. The TIME interface is based on an ArcGIS platform and is essentially a condensed transportation model, which provides a user friendly means of modifying input variables that would change the clearance times for various evacuation scenarios.

The evacuation model variables include a set of distinguishing characteristics that could apply to evacuation scenarios as selection criteria. These following variables may be selected using the TIME interface and allow the user to retrieve the best results from various evacuation alternatives:

- Analysis time period;
- Highway network;
- Behavioral response;
- One-way evacuation operations;
- University population;
- Tourist occupancy rates;
- Shelters;
- Counties evacuating;
- Evacuation level;
- Response curve hours; and,
- Evacuation Phasing.



It is anticipated that the regional planning council and local governments will be able to use the TIME User Interface to simulate additional scenarios varying behavioral assumptions, reflecting proposed growth in coastal areas, new transportation improvements, etc.

F. Glossary

The Glossary at the back of the Technical Data Report contains the definitions of the terms used throughout the document. In many cases, it represents the legal consensus of the definition of terms in statute pertaining to growth management. The SRESP represents a consistent and coordinated approach to provide tools for both the emergency management as well as the planning community in the State of Florida.

G. Conclusion and Recommendations

Obviously, the implementation of a successful evacuation from a hurricane in the Apalachee Bay Region will be complex and challenging. It will require regional coordination - not just on the part of the emergency management and response personnel - but of the entire community.

The update of the *Apalahcee Bay Region Hurricane Evacuation Study* illustrates that there have been improvements in hurricane evacuation planning including increased public shelter capacity,

assistance for the transit dependent, alternatives for evacuees with pets, special needs shelters, route improvements and growth management mitigation strategies helping to reduce the population-at-risk. However, there remain serious challenges in this region if we are to avoid the loss of life and property and human suffering witnessed in the 2005 hurricane season in Mississippi, Louisiana and Texas.

Over the past 30 years, Apalachee Regional Planning Council (ARPC), the State of Florida, County Emergency Management agencies, the American Red Cross and many other agencies have worked together to prepare regionally for a disaster – not just the inevitable strike of a hurricane but the impacts of freshwater flooding, hazardous material incidents and terrorist attack.

Recent events have tragically demonstrated the power of nature and the horrific results if government and citizens fail to respond appropriately. As public servants and elected officials, it is imperative to address the concerns of our citizens and leaders regarding our ability to manage a major disaster.

1. Public Education

Our citizens' knowledge and understanding of personal risk and appropriate evacuation response remains a serious challenge. The behavioral surveys indicated that many residents – even those in the most surge-vulnerable areas and mobile homes – believe their home would be safe in a major hurricane, do not have a family disaster plan, and many will not evacuate regardless of the intensity of the storm or government actions. This fact means that those who choose to stay behind in mobile homes and areas vulnerable to storm surge and velocity wave action might not survive a storm.

In turn, many residents - well inland of storm surge and in site-built homes - responded that they will try to evacuate -- many out of the region or state. Because of the "shadow evacuation," resulting clearance times are exceedingly high necessitating the planning of refuge shelters along critical evacuation routes, reverse laning of Interstate systems and the potential of evacuation problems seen in Houston, Texas, with Hurricane Rita (2005).

Several counties in the Apalachee Bay Region as well as some adjacent counties, produce a Hurricane Survival Guide, which is printed and distributed every year at the beginning of hurricane season. Approximately 150,000 copies of the guide were printed and distributed in 2010 in 8 counties. In addition, the guide is augmented by local (printed) information, interactive web sites, citizen information lines, public speaking engagements, and information relayed in schools, newspapers, the broadcast media and neighborhood associations throughout the season.

In order to elicit an immediate evacuation response, the population-at-risk must be clearly and conclusively convinced that (1) they are indeed residing in a vulnerable area and (2) that a decision not to leave could well mean their loss of life or injury. Post-hurricane studies have shown that the most vital piece of information is the information

received from the emergency management personnel and local officials. For the most part, people will respond based upon the urgency and seriousness of the threat as conveyed by the emergency response personnel (HMG, 1999 and 2006).

Three key messages have been identified:

- Know your risk (evacuation zone/ mobile homes)
- Make a family plan.
- Obtain emergency supplies for at least 3-5 days.

The accurate formulation and comprehensive dissemination of these critical pieces of information to the public in a simple and understandable form is essential for implementation of an effective hurricane evacuation plan.

Irrational emergency decision-making on the part of the population can be decreased if they determine their vulnerability before the emergency occurs. Residents in the Apalachee Bay Region are encouraged to become familiar with the county plans for evacuation and to make their "family plans" and business plans ahead of time. The State of Florida has partnered with the Florida Broadcasting Association to encourage the "culture of preparedness" including PSAs and billboards. Partnering at the local level is also needed.

Additional notification procedures (of evacuation level) is implemented and repeated throughout the season. The local governments in the region do have programs which provide these services to their residents so it is unclear why so many residents do not know their evacuation level or understand their risk.

- Notification on utility bills (zone designation)
- Notification on tax bills (zone designation)
- Special mailings and deliveries
- Interactive Web sites (zone look up)
- Citizen Information lines (zone look up)

Continuing to strengthen initiatives to partner with all levels of government, the private sector, civic and business associations and non-profit/volunteer agencies and the media to "get the word out" about preparedness and mitigation. Businesses have been increasingly active in developing continuity plans and providing information to their employees. Churches and civic associations, neighborhood associations, crime watch and Community Emergency Response Teams (CERT) can provide direct contact and face-to-face communication.

2. Special Needs

Providing shelter for residents with special needs is a critical issue. Partners including the Deptartment of Health, home health agencies, hospitals and skilled nursing facilities, to name

just a few, must work with local agencies to (1) register and determine the appropriate level of care and appropriate shelter alternative for each resident and (2) provide the facility, staff, equipment and supplies and transportation assistance in an effective manner in a disaster situation.

Again, we need to develop strong partnerships with those entities in the community that work with our citizens with special needs on a daily basis to ensure they receive the information and support they need before, during and after a disaster.

3. Mitigation Message

As identified, the results of the *Regional Evacuation Study for the Apalachee Bay Region* highlight the challenges of the emergency management community in coastal area such as Apalachee Bay. If people do not respond correctly when an evacuation order is given, there will be serious implications on the entire emergency response. For example, if residents who live in low-lying surge vulnerable areas or mobile homes do not evacuate, they are putting their safety at risk. Conversely, if residents who live in site-built homes outside the surge-vulnerable areas try to evacuate in significant numbers - as they did during the 1999 Hurricane Floyd evacuation and for Hurricane Rita in 2005 - the resulting traffic congestion may prevent anyone from reaching safety.

The answer is comprehensive consistent public education which focuses on encouraging our residents to do the following (1) know their risk, and (2) plan ahead. Again, key messages include:

- Individual Responsibility – Be disaster resilient. Know your risk, plan ahead and obtain needed supplies.
- Encourage residents to *"Flee from Flood; Hide from Wind".* Obviously, coastal residents in surge vulnerable areas and mobile home residents must evacuate; however, the key message is to seek refuge within "tens of miles, not hundreds of miles."
- Strongly encourage all residents who live in site-built homes outside the surge vulnerable areas to call and invite friends or relatives who must evacuate to come and stay with them if there is a hurricane threat. Once they have committed by inviting their friends or relatives, we will also encourage residents to prepare their homes and mitigate for the potential winds, i.e. window and door protection, braced gable end roofs, and garage doors.
- It is assumed if inland residents take action to protect their homes from wind, they will be less likely to try to "outrun" a hurricane.

4. The Coastal High Hazard Area (CHHA)

In 2006 the Florida Legislature passed a bill changing the definition of the coastal high hazard area (CHHA) from the evacuation zone to the "area defined by the SLOSH model

to be inundated from a category one hurricane." This change was welcome as the definition was more defensible tying the land use regulations to a scientific model rather than the zone delineated by roadways and familiar landmarks. However, the limitations of the model must be recognized by the local governments now responsible for its regulation.

The SLOSH model does not address wave height and other local processes. It also does not incorporate the danger of isolation in areas surrounded by storm surge with limited access such as barrier islands. These two issues are of serious concern and it is recommended that local governments address them within their comprehensive plans and land development regulations.

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Glossary Introduction

The methodology for determining evacuation clearance times for growth management and emergency management purposes were agreed upon by both the Department of Community Affairs and the Division of Emergency Management. This methodology included four planning assumptions which were reviewed and discussed in detail. The planning assumptions establish the appropriate evacuation population, shadow evacuation, vehicle usage and response rate to use in the baseline scenario. The planning assumptions are based on statutory authority and extensive behavioral analysis completed for this study. The resulting clearance times are applied in growth management decision making and will help guide future decisions on comprehensive plan amendments in the coastal areas of the State.

Based on the planning assumptions, the baseline scenario stipulates that one hundred percent (100%) of the population in an evacuation zone is used when calculating the clearance times for growth management purposes. This percentage is based on Florida Statues *(Section 163.3178(2)(d)).* Additionally, the concept of shadow evacuation is an important factor to consider when calculating clearance times and is utilized in the baseline scenario. The percentage of shadow evacuation used varies by region and is determined by the behavioral analysis conducted for each region. The complete information can be found in Volume 2: Regional Behavioral Analysis, prepared by Dr. Jay Baker. A summary of this information can also be found in Volume 1: Chapter III – Regional Behavioral Analysis Summary.

Vehicle usage rates are based upon the behavioral analyses conducted as part of the Statewide Regional Evacuation Study (SRES) Program. This analysis takes into consideration the different characteristics throughout the state with regard to the numbers of vehicles people might use during an evacuation. These usage rates vary by region, based on the behavioral analysis. Finally, a 12-hour evacuation response curve is used as the evacuation response rate. There is no statutory basis for selecting a particular evacuation response rate; however, the use of the 12-hour response curve is consistent with emergency planning practices currently used by county emergency managers across the state. It is a reasonable approximation of evacuation responses over a range of scenarios.

In part, the planning assumptions are definitions to key terminology used in both growth management and emergency management applications. All terms were reviewed in relation to Rules 9J-2 and 9J-5, Florida Administrative Code and Chapters 163 and 186, Florida Statutes. If a term has been defined by a statute or rule, the definition is used. A portion of the terms are widely accepted planning or emergency management terms which not been documented previously. This glossary allows these terms to be formally defined through the SRES. Finally, some terms are defined 'for purposes of this study', which recognizes that other definitions may exist that are applicable in other scenarios.

Glossary

- **Alternate Hazards**

For purposes of this study, alternative hazards are those hazards other than hurricanes that may initiate a regional or multi-jurisdictional evacuation.

- **Clearance Time**

The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the region based on a specific hazard, behavioral assumptions and evacuation scenario. Usually used with a specific or implied clarifying term (i.e. in-county clearance time).

- **Clearance Time, County (County Clearance Time)**

This is the time used by Emergency Managers to determine when to recommend evacuation orders. The time required to evacuate all persons wishing to evacuate, in the event of a specific hazard (i.e. Category 3 Hurricane County Clearance Time). This is calculated from the time the county evacuation order is given until the last evacuee vehicle exits the county. This calculation includes the population-at-risk, shadow evacuees, as well as the evacuees from other counties anticipated to pass through the county (through vehicles). Additionally, clearance time begins when the evacuation order is given and ends when the last vehicle reaches a local shelter or the county line on the way to inland shelter. The clearance time is developed to include the time required for evacuees to secure their homes and prepare to leave, the time spent by all vehicles traveling along the evacuation route network and the additional time spent on the road caused by traffic and road congestion. Clearance time does not relate to the time any one vehicle spends traveling along the evacuation route network. It also does not guarantee vehicles will safely reach their destination once outside the County.

- **Clearance Time, In-County**

The time required from the point an evacuation order is given until the last evacuee can either leave the evacuation zone or arrive at safe shelter within the County. This does not include those evacuees leaving the County, on their own.

- **Clearance Time, Out-Of-County**

"Out-of County" Clearance Time -- the time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point an evacuation order is given to the point in time when the last vehicle assigned an external destination exits the county.

- **Clearance Time, To-Shelter**

"Time to Shelter" Clearance Time -- the time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point in time when the evacuation order is given to the point in time when the last vehicle reaches a point of safety within the county. This scenario assumes there is sufficient shelter (friend, relative, public shelter, hotel/motel) capacity within the county.

- **Coastal High Hazard Area (CHHA)**

Per State Statute Chapter 163, for purposes of this study the CHHA is illustrated in the Regional Storm Tide Atlas of this study.

- **County Evacuation Time**

A general term used to; 1) refer to the time it takes an individual to evacuate a county once ordered; 2) mobilization time, queuing or delay time; and 3) any pre-landfall hazards time.

- **Critical Facilities**

Those facilities identified by the County Emergency Management as critical to life safety, governmental operations, or economic recovery. These facilities may include Critical Infrastructure or Key Assets.

- **Critical Infrastructure**

Those infrastructure facilities that meet the federal definition of Key Assets or Critical Infrastructure; these assets, if lost, could have regional, statewide, or national impacts.

- **Critical Roadway Segment**

Roadway segments with the highest evacuation vehicles to service volume ratio.

- **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(side) of the region.

- **Evacuation Route**

For purposes of this study these are routes designated by county emergency management officials, or state emergency management officials, or those identified by standardized statewide directional signs by the Florida Department of Transportation, or are identified in the regional evacuation study for movement of persons to safety in the event of an ordered evacuation.

- **Evacuation Route Assignments**

Route assignments provide specific geographic areas with predetermined paths away from the coast. During traffic modeling, these route assignments are designed to ensure that all evacuation-route roadway capacity is utilized to the fullest.

- **Evacuation Time**

A general term used to refer to 1) the mobilization time; 2) The time it takes an individual to evacuate once ordered; 3) queuing or delay time; and 4) any pre-landfall hazards time, if appropriate.

- **Evacuation Time to Shelter**

A general term used to refer to 1) clearance time to shelter plus; 2) the time it takes an individual to evacuate once ordered; and 3) pre-landfall hazards time.

- **Evacuation Timing Curves**

A response curve indicating the cumulative percentage of eventual evacuees who had departed by various times during the threat.

- **Future Land Use Map (FLUM)**

A depiction of proposed general distribution, location and extent of the land for residential uses, commercial uses, industry, agriculture, recreation, conservation, education, public buildings and grounds, other public facilities and other categories of public and private uses of land found in the Future Land Use Element of the local comprehensive plan.

- **High Hazard Hurricane Evacuation Area**

The areas identified in the most current regional hurricane evacuation study as requiring evacuation during a category one hurricane event. * *Source: 9J-2.0256, F.A.C.*

* The Department of Community Affairs has consistently found that this rule can not be interpreted to mean that land within the CHHA can be filled in order to elevate the property outside of this designation *[Department of Community Affaris vs. City of Jacksonville. DOAH Case Nos. 07-3539GM, 08-4193GM (2008)]*

- **Hurricane Evacuation Plan**

An operational plan developed by an Emergency Management Agency to safely warn and evacuate the hurricane population-at-risk including special needs populations, reduce county clearance times, provide for shelter and mass care during the event and re-entry when conditions are deemed safe to return.

- **Hurricane Evacuation Route**

An evacuation route identified for use specifically for hurricane hazards.

- **Hurricane Shelter Space**

Hurricane Shelter Space is at a minimum, an area of twenty square feet per person located within a hurricane shelter. *Source: 9J-2.0256, F.A.C.*

- **Hurricane Vulnerability Zone**

The Hurricane Vulnerability zone is the area delineated by a regional hurricane evacuation study as requiring evacuation in the event of a 100-year or category three hurricane event*. Source*: *9J-2.0256, F.A.C.*

- **Inland Shelter Study/Plan**

Inland Shelter Study/Plan is a study produced by the Division of Emergency Management and the state's regional planning councils which detail regional public hurricane shelter availability according to various simulated regional hurricane events. *Source: 9J-2.0256, F.A.C.*

- **LIDAR Li**ght **D**etection **a**nd **R**anging

An optical remote sensing technology that measures properties of scattered light to find the range and/or other information on a distant target. The prevalent method to determine distance to an object or surface is to use laser pulses. Like the similar radar technology, which uses radio waves instead of light, the range to an object is determined by measuring the time delay between transmission of a pulse and detection of the reflected signal.

- **Local Comprehensive Emergency Management Plan**

Those plans developed by a county according to the provisions of Chapters 9G-6 and 9G-7, Florida Administrative Code, under the authority provided in Section 252.38, Florida Statues. *Source*: *9J-2.0256, F.A.C.*

- **MEOWS (**Maximum Envelope of Water)

The plotted maximum surge heights for a given storm category and track.

- **MOMS (**Maximums of the Maximums)

The MOMs represent the maximum surge expected to occur at any given location, regardless of the storm track or direction of the hurricane.

- **Mitigation of Hurricane Impacts** *(9J-2.0256 (5) Hurricane Preparedness Policy Rule)*

Due to the extreme vulnerability of the State of Florida to the impacts of hurricanes, the Department of Community Affairs considers public hurricane shelters and hurricane evacuation routes as important public facilities that are required to insure the health, safety, and welfare of the residents of the state. In order to implement this policy, it is the intent of the Department of Community Affairds to set forth in this rule hurricane preparedness conditions which, if included in a DRI development order and which ensure that the development's anticipated regional hurricane preparedness impacts are mitigated in a timely manner, would be deemed by the Department of Community Affaris to comply with the requirements of subparagraph 380.06(15)(e)e., Florida Statutes. Such conditions would therefore not be the basis for the appeal of the development order by the Department of Community Affairs on issues related to hurricane preparedness. The Department of Community Affairs will review mitigative measures for all ADA proposals and DRI developmetn orders that are determined to have a substantial impact on regional hurricane preparedness based on the critieria identified in subsection (4) above.

Pursuant to subparagraph 380.06(15)(e)2., Florida Statutes, a DRI development order issued by a local government must make adequate provisions for the public facilities needed to accommodate the impacts of the proposed development. Any single or combination of mitigative techniques detailed in paragraph (a) below must provide for mitigation equivalent to the proposed development's anticipated hurricane preparedness impacts. However, nothing contained herein shall preclude the local government from including hurricane preparedness conditions in a development order that are more stringent than those detailed in paragraph (a) below.

(a) Techniques which shall be used singly or in concert pursuant to the provisions of subsection (5) above to mitigate the anticipated impact of a proposed development on public hurricane shelter availability are:

1. Donation of land for public facilities or donation of the use of private structures to be used as primary public hurricane shelters; however, the site or private structure shall be located in an area outside of the identified high hazard hurricane evacuation area. The facility shall be constructed in such a way as to insure its usefulness and use as a primary public hurricane shelter to offset, at a minimum, the impacts of the approved DRI development. In order to use this mitigation option, the developer must provide reasonable assurance from the local political subdivision and from local emergency management officials regarding the ability of the donation to reduce hurricane shelter impacts.

2. Provision of payments in lieu of donation of land for the upgrading of existing primary and secondary hurricane shelters located outside the identified hurricane vulnerability zone so as to increase the county's primary public hurricane shelter space availability equal to the proposed development's anticipated public hurricane shelter space demand. Upgrading for purposes of this rule shall include the addition of hurricane storm shutters to facilities, provision of electric generators, provision of potable water storage capability, and other items which may be appropriate for a public hurricane shelter. In order to use this mitigation option, the developer must provide reasonable assurance from the local political subdivision and from local emergency management officials regarding the provision's ability to reduce the development's hurricane shelter impacts.

3. Provision of onsite shelter where the proposed shelter would be located outside of the identified hurricane vulnerability zone and the project includes a community center or other facility suitable for use as hurricane shelter and provides, at a minimum, shelter space available and equal to the proposed development's anticipated hurricane shelter space demand. Examples of community facilities include, but would not be limited to, clubhouses and recreation centers. All community facilities that are to be used as hurricane shelters under this mitigation option must be equipped with appropriate items as identified in subsection (2) above, and must be approved by local emergency management officials.

4. Provision of funds to be used for the purpose of training public hurricane shelter managers through a program provided by the local chapter of the American Red Cross, local emergency management officials, or the Department. In order to use this mitigation option, the developer must provide reasonable assurance from local emergency management officials and the local chapter of the American Red Cross regarding the provision's ability to reduce the development's hurricane shelter impacts. * *Source: 9J-2.0256, F.A.C.*

* Please note this is an excerpt of *9J-2.0256 (5), F.A.C. only. For complete references and rule, please see the statute in its entirety, 9J-2.0256, F.A.C.*

- **Mobile Home**

"Mobile home" means a structure, transportable in one or more sections, which is 8 body feet or more in width and which is built on an integral chassis and designed to be used as a dwelling when connected to the required utilities and includes the plumbing, heating, air-conditioning, and electrical systems contained therein. For tax purposes, the length of a mobile home is the distance from the exterior of the wall nearest to the drawbar and coupling mechanism to the exterior of the wall at the opposite end of the home where such walls enclose living or other interior space. Such distance includes expandable rooms, but excludes bay windows, porches, drawbars, couplings, hitches, wall and roof extensions, or other attachments that do not enclose interior space. In the event that the mobile home owner has no proof of the length of the drawbar, coupling, or hitch, then the tax collector may in his or her discretion either inspect the home to determine the actual length or may assume 4 feet to be the length of the drawbar, coupling, or hitch. *Source: Section 320.01, Florida Statutes*

- **On-site Shelter**

Sheltering within a development site.

- **Other Shelter**

Shelters that do not qualify as primary shelters.

- **Park Trailer**

The "park trailer," which is a transportable unit which has a body width not exceeding 14 feet and which is built on a single chassis and is designed to provide seasonal or temporary living quarters when connected to utilities necessary for operation of installed fixtures and appliances. The total area of the unit in a setup mode, when measured from the exterior surface of the exterior stud walls at the level of maximum dimensions, not including any bay window, does not exceed 400 square feet when constructed to ANSI A-119.5 standards, and 500 square feet when constructed to United States Department of Housing and Urban Development Standards. The length of a park trailer means the distance from the exterior of the front of the body (nearest to the drawbar and coupling mechanism) to the exterior of the rear of the body (at the opposite end of the body), including any protrusions. *Source: Section 320.01, Florida Statutes*

- **Phased Evacuation**

A staged evacuation, under which only a portion of the vulnerable population is evacuated at a time.

- **Point of Safety (Place of Safety)**

A destination, determined by the evacuee, outside of the evacuation zone where the evacuee perceives he or she is safe.

- **Primary Shelter (primary public hurricane shelter)**

Primary public hurricane shelter – a structure designated by local emergency management officials as a place for shelter during a hurricane event which they can open. Primary public shelters include only those structures which are located outside of the high hazard hurricane evacuation area and which have been designated as American Red Cross 4496 compliant. *Source: 9J-2.0256, F.A.C.*

- **Recreational Vehicle**

A recreational vehicle-type unit primarily designed as temporary living quarters for recreational, camping, or travel use, which either has its own motive power or is mounted on or drawn by another vehicle. *Source: Section 320.01, Florida Statutes*

- **Region**

For purposes of this study a region is one of the comprehensive planning regions as established by the State of Florida Chief Planning Officer (Governor). These are also the regional planning council districts.

- **Regional Clearance Time**

The time necessary to safely evacuate vulnerable residents and visitors to a “point of safety” within the (RPC) region based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point in time when the evacuation order is given to the point in time when the last vehicle assigned an external destination exits the region.

- **Regional Evacuation Routes**

1) For purposes of this study, these are evacuation routes, roadways and roadway segments identified in this study as routes used to interconnect county designated evacuations routes, or routes used to interconnect evacuation routes between study regions. *2)* Major highways that

are part of the regional and statewide network including primary (interstates and turnpikes), secondary (major arterials), and certain local roadways (Minor arterials) which provide significant evacuation transportation capacity to move vulnerable populations to "points of safety". Official *Regional Evacuation Routes* are determined by the County Emergency Management Agencies, in coordination with the FDOT and RPCs.

- **Regional Evacuation Transportation Network**

The transportation network used in this study to analyze the movement of traffic during ordered evacuations, and used to calculate the various clearance times.

- **Regional Hurricane Evacuation Study (Hurricane Evacuation Study, Regional Evacuation Study, Regional Hurricane Evacuation Plan)**

A study produced by the Department of Community Affairs, the State Division of Emergency Management the state's regional planning councils, the US Army Corps of Engineers, or the Federal Emergency Management Agency, which detail regional hurricane evacuation clearance times and public hurricane shelter availability according to various simulated regional hurricane events. *Source: 9J-2.0256, F.A.C.*

- **Reverse Lane Operations (previously referred to as Contra Flow Routes)**

Lane Reversals alter the normal flow of traffic, which are considered a potential remedy to reduce congestion during evacuation and/or emergency conditions by increasing the directional flow of traffic.

- **Secondary Public Hurricane Shelter**

A structure designated by local emergency management officials and the American Red Cross as a shelter during a hurricane but does not meet the criteria of a primary public hurricane shelter. *Source: 9J-2.0256, F.A.C.*

- **Sea, Lake and Overland Surges from Hurricanes (SLOSH) Basin Data**

The bathymetric and terrestrial digital elevation models produced from the LIDAR data, utilized in the SLOSH model.

- **Shadow Evacuation Population.**

Persons not affected by an evacuation order that choose to evacuate to another location they feel is safer. This population resides outside the designated evacuation zone and lives in site-built structures. The shadow evacuation population can be significant when the risk is perceived to be great.

- **Small Area Data**

The socioeconomic data for the base year of 2006 and projected years of 2010 and 2015 utilized to model evacuation traffic. These data contain population and dwelling unit information that will identify where the individuals in the region reside.

- **Special Hurricane Preparedness District**

A county or region that has been designated by Department of Community Affairs rule for special consideration because of its unique hurricane vulnerability and preparedness situation. *Source: 9J-2.0257, F.A.C.*

- **Statewide Regional Evacuation Study Program (SRESP)**

See Regional Hurricane Evacuation Study

- **Storm Surge Atlas/Storm Tide Atlas**

A series of maps that depict the potential storm surge and flooding as derived from the SLOSH model from hurricanes of five different intensities. The Category One Storm Surge zone depicts the Coastal High Hazard Area (CHHA).

- **Substantial Impact on Regional Hurricane Preparedness (determination of)**

Any proposed development which exceeds the thresholds identified in paragraphs (a), (b), or (c) below, shall be determined by the Department to have a substantial impact on regional hurricane preparedness.

(a) When a development is proposed in a county where a public hurricane shelter space deficit is shown to exist according to the applicable, incorporated regional hurricane evacuation study, inland shelter study or county shelter assessment based on an adopted county peacetime emergency plan, and the proposed development's anticipated public hurricane shelter space demand will require a minimum of 200 additional spaces, or five percent of the county's public hurricane shelter space capacity, whichever is less, the proposed development will be determined by the Department to have a significant regional impact on public hurricane shelter space availability.

(b) When a development is proposed in a county where a public hurricane shelter space surplus is shown to exist according to the applicable, incorporated regional hurricane evacuation study, inland shelter study or county shelter capacity assessment based on an adopted county peacetime emergency plan, and the proposed development's anticipated public hurricane shelter space demand is projected to move the county into a deficit situation of 200 or more spaces, the proposed development will be determined by the Department to have a significant regional impact on public hurricane shelter space availability.

(c) When a development is proposed in a hurricane vulnerability zone and the proposed development's anticipated evacuation traffic will utilize twenty-five (25) percent or more of an identified hurricane evacuation route's level of service E hourly directional maximum service volume based on the Florida Department of Transportation's Generalized Peak Hour/Peak Direction Level of Service Maximum Volumes presented in the Florida Highway Systems Plan Level of Service Standards and Guidelines Manual and hereby incorporated by reference, the proposed development will be determined by the Department of Community Affairs to have a significant regional impact on hurricane evacuation. *Source: 9J-2.0256, F.A.C.*

- **Time Constrained Evacuation**

Events in which there is a shortened timeframe available for evacuation movements. This impacts the number of evacuees who are able to reach their desired evacuation destination.

- **Time To Shelter**

The time required from the time an evacuation order is given until the last individual evacuee arrives at safe shelter.

- **Traffic Evacuation Zone (TEZ)**

Sub-evacuation zones created as part of the transportation analysis, used in conjunction with traffic model assumptions to operate the model and calculate various clearance times.

- **USNG** United States National Grid

The United States National Grid is a nonproprietary alphanumeric referencing system derived from the Military Grid Reference System (MGRS) that is being promoted to increase the interoperability of location services appliances with printed map products by providing a nationally consistent grid reference system.

ACRONYMS

ADA – Americans with Disabilities Act
AHCA – Agency for Health Care Administration
ALF – Assisted Living Facilities
ARC – American Red Cross
ASL – Above Sea Level
BFE – Base Flood Elevation
CEMP – Comprehensive Emergency Management Plan
CF – Critical Facilities
CHHA – Coastal High Hazard Area
DCA – Department of Community of Affairs
DFIRM – Digital Flood Insurance Rate Map
DOH – Department of Health
EHPA – Enhanced Hurricane Protection Areas
EOC – Emergency Operations Center
FAC – Florida Administrative Code
FBC – Florida Building Code
FDEM – Division of Emergency Management
FDOT – Florida Department of Transportation
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FLASH – Florida Alliance for Safe Homes
FLUM – Future Land Use Map
FOUO – For Official Use Only
FS – Florida Statute
GIS – Geographic Information System
Hazmat – Hazardous Material
HAZUS – Hazards United States
LEPC – Local Emergency Planning Committee
LiDAR – Light Detection and Ranging
LMS – Local Mitigation Strategies
MEOW – Maximum Envelope of Water
MOM – Maximum of Maximums (or MEOWs)
MPO – Metropolitan Planning Organization
MSL – Mean Sea Level
NFIP – National Flood Insurance Program
NGVD – National Geodetic Vertical Datum
NHC – National Hurricane Center
NOAA – National Oceanic and Atmospheric Administration
NWS – National Weather Service
POD – Point of Distribution
RES – Regional Evacuation Study
RPC – Regional Planning Council
SAD – Small Area Data
SAR – Search and Rescue
SEOC – State Emergency Operations Center
SLOSH – Sea, Lake and Overland Surges from Hurricanes

SpNS – Special Needs Shelters
SRESP – Statewide Regional Evacuation Study Program
TAZ – Traffic Analysis Zones
TEZ – Traffic Evacuation Zones
USNG – United States National Grid
WFO – Weather Field Office
WUI – Wildland Urban Interface

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