

# **VOLUSIA COUNTY, FLORIDA**



## **MULTI-JURISDICTIONAL LOCAL MITIGATION STRATEGY**

**JUNE 2015**

**PREPARED BY THE VOLUSIA PREPARES LMS WORKING GROUP**

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## SECTION 1 – INTRODUCTION

This section of the Plan provides a general introduction to the Volusia County Multi-jurisdictional Local Mitigation Strategy (LMS). It consists of the following five subsections:

- ▶ **Background**
- ▶ **Purpose**
- ▶ **Scope**
- ▶ **Authority**
- ▶ **Summary of Plan Contents**

### 1.1 BACKGROUND

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Natural hazards, such as hurricanes, floods and tornadoes, are a part of the world around us. Their occurrence is natural and inevitable, and there is little we can do to control their force and intensity. We must consider these hazards to be legitimate and significant threats to human life, safety and property.

Volusia County, Florida is vulnerable to a wide range of natural hazards, including hurricanes and tropical storms, flooding, tornadoes and wildfires. These hazards threaten the life and safety of county residents, and have the potential to damage or destroy both public and private property and disrupt the local economy and overall quality of life of individuals who live, work and vacation in the community.

While the threat from hazardous events may never be fully eliminated, there is much we can do to lessen their potential impact upon our community and our citizens. By minimizing the impact of hazards upon our built environment, we can prevent such events from resulting in disasters. The concept and practice of reducing risks to people and property from known hazards is generally referred to as *hazard mitigation*.



**FEMA Definition of Hazard Mitigation:**

*“Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.”*

Hazard mitigation techniques include both structural measures, such as strengthening or protecting buildings and infrastructure from the destructive forces of potential hazards and non-structural measures, such as the adoption of sound land use policies and the creation of public awareness programs. It is widely accepted that the most effective mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. A comprehensive mitigation approach addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore it is essential that projected patterns of future development are evaluated and considered in terms of how that growth will increase or decrease a community’s overall hazard vulnerability.

## SECTION 1: INTRODUCTION

As a community formulates a comprehensive strategy to hazard mitigation, a key component is to develop, adopt and update a Local Mitigation Strategy. A LMS/hazard mitigation plan establishes the broad community vision and guiding principles for reducing hazard risk and further proposes specific mitigation actions to eliminate or reduce identified vulnerabilities. Each of the jurisdictions has adopted the LMS by resolution (Appendix A).

The Volusia County Multi-jurisdictional Local Mitigation Strategy has evolved over the years, as more thoroughly described in Section 2: Planning Process. The Volusia Prepares LMS Working Group (LMS Working Group) has developed Bylaws and Operating Procedures (Appendix B) to formalize the LMS update process and working group. The Plan documents and represents the County's and participating local jurisdictions' sustained efforts to incorporate hazard mitigation principles and practices into the routine government activities and functions of Volusia County and its participating jurisdictions and partners. This includes documenting the goals and objectives that Volusia County deems necessary to protect people and property from hazards. At its most inner core, the Plan recommends specific actions to combat hazard vulnerability and protect its residents from losses to those hazards that pose the greatest risk. Actions go beyond recommending micro-level solutions such as elevation, retrofitting and acquisition projects, and also address macro-level solution. Examples of macro-level actions that contribute to reducing the future vulnerability of Volusia County include local policies on community growth and development, incentives for natural resource protection and public awareness and outreach activities. Finally, the Plan is a living document, with implementation, evaluation and update procedures included to help achieve meaningful objectives and successful outcomes over time.

### 1.1.1 Disaster Mitigation Act of 2000

In an effort to reduce the Nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) in order to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of DMA 2000 emphasizes the need for state and local government entities to closely coordinate on mitigation planning activities, and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP) and the newly-created Pre-Disaster Mitigation (PDM) program, both of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally-approved hazard mitigation plan thereby become pre-positioned and are more apt to receive available mitigation funds before and after the next disaster strikes.

The Volusia County Multi-jurisdictional LMS has been prepared in coordination with FEMA Region IV and the Florida Division of Emergency Management to ensure that the Plan meets all applicable DMA 2000 and state requirements. A *Local Mitigation Plan Review Crosswalk*, found in [Appendix C](#), provides a summary of federal and state minimum standards and notes the location where each requirement is met within the Plan.

### 1.2 PURPOSE

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The purpose of the Volusia County Multi-jurisdictional LMS is to:

- ▶ **Provide a comprehensive update to the *Volusia County Local Hazard Mitigation Plan*, as amended in 2009 that is compliant with federal and state requirements.**
  - This Plan is intended to assist participating jurisdictions to comply with requirements in order to expedite the response and recovery process. In addition, compliance is often required to obtain state and federal funding for pre-disaster mitigation projects and post-disaster situations. This Plan allows participating jurisdictions to quickly assemble the necessary grant application materials when seeking funding.
- ▶ **Provide a methodical, substantive approach to mitigation planning.**
  - The use of a methodical approach ensures that each step in the planning process builds upon the last, resulting in a high level of assurance that proposed mitigation actions have a valid basis.
- ▶ **Enhance public awareness and understanding of hazard mitigation planning.**
  - Engaging the public in the local mitigation planning process shapes the goals, objectives and policies in this Plan. Further, it provides a method for educating the public on how to protect themselves from the impacts of hazards.
- ▶ **Create a decision tool for management.**
  - This plan provides local managers, leaders and officials with the tools needed to reduce vulnerabilities to future hazard events.
- ▶ **Enhance local policies for hazard mitigation capability.**
  - The Capability Assessment found in Section 7 outlines the policies in Volusia County and the participating jurisdictions to reduce hazard vulnerability. Volusia County the participating jurisdictions aim to enhance and create policies to address mitigating the impacts of a hazard is such policies do not already exist.
- ▶ **Assure inter-jurisdictional coordination of mitigation-related programming.**
  - By creating a multi-jurisdictional plan, this Plan ensures coordination of mitigation activities. This ensures that mitigation actions proposed or implemented by one jurisdiction will be compatible with the actions pursued by another.
- ▶ **Provide jurisdiction-specific hazard mitigation vulnerability assessments and actions.**
  - The vulnerability of each jurisdiction will be outlaid in the Vulnerability Assessment. Further, each jurisdiction, based on its vulnerability, will have actions to address hazard vulnerability.

## SECTION 1: INTRODUCTION

### 1.3 SCOPE

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The focus of the Volusia County Multi-jurisdictional LMS is on those hazards deemed to be “high” or “moderate” risk as determined through a detailed hazard risk assessment conducted for Volusia County. Other hazards that pose a “low” or “negligible” risk will continue to be evaluated during future updates to the Plan, but they may not be fully addressed until they are determined to be of high or moderate risk. This enables Volusia County and its participating jurisdictions to prioritize mitigation actions based on those hazards which are understood to present the greatest risk to lives and property.

The geographic scope (i.e., the planning area) for the Plan includes all areas within the unincorporated jurisdiction of Volusia County and the participating incorporated municipalities: Daytona Beach, Daytona Beach Shores, DeBary, DeLand, Deltona, Edgewater, Holly Hill, Lake Helen, New Smyrna Beach, Oak Hill, Orange City, Ormond Beach, Pierson, Ponce Inlet, Port Orange and South Daytona. In addition, other entities, such as the Volusia County School Board, Halifax Medical Center, various Florida Hospital locations, American Red Cross and the Daytona Beach International Airport participated in the planning process. See Section 2, Table 2.1 for a full list of participating entities.

### 1.4 AUTHORITY

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The Volusia County Multi-jurisdictional LMS has been developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans, and has been adopted by Volusia County and its participating jurisdictions and partners in accordance with standard local procedures. Copies of local adoption resolutions are provided in Appendix A. The Plan shall be routinely monitored and revised to maintain compliance with the following provisions, rules and legislation:

- ▶ Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390); and
- ▶ FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201.

### 1.5 SUMMARY OF PLAN CONTENTS

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The contents of this Plan are designed and organized to be as reader-friendly and functional as possible. While significant background information is included on the processes used and studies completed (i.e., risk assessment, capability assessment), this information is separated from the more meaningful planning outcomes or actions (i.e., mitigation strategy, mitigation action plans).

Section 2: **Planning Process**, provides a complete narrative description of the process used to prepare the Plan. This includes the identification of who was involved, who participated on the planning team, and how the public and other stakeholders were involved. It also includes a detailed summary for each of the key meetings held along with any associated outcomes.

The **Community Profile**, located in Section 3, describes the general makeup of Volusia County, including prevalent geographic, demographic and economic characteristics. In addition, building characteristics

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and land use patterns are discussed. This baseline information provides a snapshot of the planning area and thereby assists local officials recognize those social, environmental and economic factors that ultimately play a role in determining community vulnerability to hazards.

The Risk Assessment is presented in three sections: Section 4: **Hazard Identification**; Section 5: **Hazard Profiles**; and Section 6: **Vulnerability Assessment**. Together, these sections serve to identify, analyze and assess the overall risk posed to Volusia County and the participating jurisdictions from hazards. The risk assessment also attempts to define any hazard risks that may uniquely or exclusively affect specific areas of Volusia County or its participating jurisdictions and partners.

The Risk Assessment builds on available historical data from past hazard occurrences, establishes detailed profiles for each hazard, and culminates in a hazard risk ranking based on conclusions about the frequency of occurrence, spatial extent and potential impact of each hazard. FEMA's HAZUS<sup>®MH</sup> loss estimation methodology and Mapping for Emergency Management, Parallel Hazard Information System (MEMPHIS) results were also used in evaluating known hazard risks by their relative long-term cost in expected damages. In essence, the information generated through the risk assessment serves a critical function as Volusia County and the participating jurisdictions seek to determine the most appropriate mitigation actions to pursue and implement—enabling it to prioritize and focus its efforts on those hazards of greatest concern and those structures or planning areas facing the greatest risk(s).

The **Capability Assessment**, found in Section 7, provides a detailed analysis of the capacity in Volusia County and the participating jurisdictions to implement meaningful mitigation strategies and identifies existing opportunities to increase and enhance that capacity. Specific capabilities addressed in this section include planning and regulatory capability, staff and organizational (administrative) capability, technical capability, fiscal capability and political capability. Information was obtained through the use of detailed survey questionnaires for local officials and an inventory and examination of existing plans, ordinances and relevant documents. The purpose of this assessment is to identify any existing gaps, weaknesses or conflicts in programs or activities that may hinder mitigation efforts, and to identify those activities that should be built upon in establishing a successful and sustainable local hazard mitigation program.

The **Community Profile**, **Risk Assessment** and **Capability Assessment** collectively serve as a basis for determining the goals for the Volusia County Multi-jurisdictional LMS, each contributing to the development, adoption and implementation of a meaningful and manageable *Mitigation Strategy* that is based on accurate background information.

The **Mitigation Strategy**, found in Section 8, consists of broad countywide goal statements as well as an analysis of hazard mitigation techniques for Volusia County and its participating jurisdictions and partners to consider in reducing hazard vulnerabilities. The Strategy provides the foundation for a detailed **Mitigation Action Plan**, found in Section 9, which links specific mitigation actions for each County department or agency to locally-assigned implementation mechanisms and target completion dates. Together, these sections are designed to make the Plan both strategic (through the identification of long-term goals) but also functional through the identification of short-term and immediate actions that will guide day-to-day decision-making and project implementation.

In addition to the identification and prioritization of possible mitigation projects, emphasis is placed on the use of program and policy alternatives to help make Volusia County and the participating

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jurisdictions less vulnerable to the damaging forces of hazards while improving the economic, social and environmental health of the community. The concept of multi-objective planning was emphasized throughout the planning process, particularly in identifying ways to link, where possible, hazard mitigation policies and programs with complimentary community goals related to disaster recovery, housing, economic development, recreational opportunities, transportation improvements, environmental quality, land development and public health and safety.

Section 10: ***Plan Maintenance Procedures***, includes the measures that Volusia County and the participating jurisdictions will take to ensure the Plan's continuous long-term implementation. The procedures also include the manner in which the Plan will be regularly evaluated and updated to remain a current and meaningful planning document.

## SECTION 2 – PLANNING PROCESS

### 44 CFR Requirement

**44 CFR Part 201.6(c)(1):** The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

This section describes the planning process undertaken by Volusia County in the development of the 2014 Multi-jurisdictional Local Mitigation Strategy. It consists of the following six subsections:

- ▶ **Overview of Hazard Mitigation Planning**
- ▶ **History of Hazard Mitigation Planning in Volusia County**
- ▶ **Preparing the 2009 Plan**
- ▶ **The Volusia Prepares Local Mitigation Strategy Working Group**
- ▶ **Community Meetings and Workshops**
- ▶ **Involving the Public and Identified Stakeholders**

### 2.1 OVERVIEW OF HAZARD MITIGATION PLANNING

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Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks and determining how to best minimize or manage those risks. This process results in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short-term planning objectives and a long-term community vision.

To ensure the functionality of a hazard mitigation plan, responsibility is assigned for each proposed mitigation action to a specific individual, department or agency along with a schedule or target completion date for its implementation. Plan maintenance procedures are established for the routine monitoring of implementation progress, as well as the evaluation and enhancement of the mitigation plan itself. These plan maintenance procedures ensure that the plan remains a current, dynamic and effective planning document over time that becomes integrated into the routine local decision making process.

Mitigation planning offers many benefits, including:

- ▶ **Saving lives and property**
- ▶ **Saving money**
- ▶ **Speeding recovery following disasters**
- ▶ **Reducing future vulnerability through wise development and post-disaster recovery and reconstruction**
- ▶ **Expediting the receipt of pre-disaster and post-disaster grant funding**
- ▶ **Demonstrating a firm commitment to improving community health and safety**

Typically, mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that

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the investments made before a hazard event will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery and reconstruction. Furthermore, mitigation practices will enable local residents, businesses and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond solely reducing hazard vulnerability. Measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, maintaining environmental health and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation.

### 2.2 HISTORY OF HAZARD MITIGATION PLANNING IN VOLUSIA COUNTY

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Volusia County's hazard mitigation planning efforts began in 1997 with the formation of the Volusia Prepares Committee. The Volusia 2020 Committee developed the first LMS in 1999 (adopted 2000), as part of the Florida Department of Community Affairs LMS Initiative. The last version of the LMS, prior to the 2014 version, was updated in 2009 (adopted in 2009).

### 2.3 PREPARING THE 2014 LMS

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The 2014 LMS update was prepared by the East Central Florida Regional Planning Council with assistance from Volusia County Emergency Management Staff. The LMS Update process was led by Volusia County Emergency Management Plans Coordinator Larry LaHue and Volusia County LMS Coordinator Pat White. The LMS was updated during May to October, 2014.

Per the contractual scope of work<sup>1</sup>, the consultant team utilized the mitigation planning process recommended by FEMA (Publication Series 386) and recommendations provided by Florida Division of Emergency Management mitigation planning staff. A Local Mitigation Plan Crosswalk, found in Appendix C, provides a detailed summary of FEMA's current minimum standards of acceptability for compliance with the DMA 2000 and notes the location of where each requirement is met within the Plan. These standards are based upon FEMA's Interim Final Rule as published in the Federal Register on February 26, 2002, in Part 201 of the 44 Code of Federal Regulations.

The 2014 LMS was prepared using an updated plan outline and incorporated relevant content from the 2009 LMS. The LMS Working Group updated various parts of the 2009 LMS, as exemplified below:

- *Stakeholders*  
The LMS Working Group identified additional stakeholders that they would like to participate in the LMS update process. These stakeholders were invited to subsequent meetings.

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<sup>1</sup> A copy of the negotiated contractual scope of work between Volusia County and ECFRPC is available through Volusia County upon request.

## SECTION 2: PLANNING PROCESS

- *Plan Outline*  
The LMS Working Group agreed to revise the plan outline that was proposed by the consultant.
- *Hazards*  
The LMS Working Group decided to include natural hazards in the 2009 LMS update, per DMA 2K requirements. Societal and technical hazards occurrences have not varied over the past five years, and many of these hazards are addressed through other emergency preparedness and response plans (e.g., Comprehensive Emergency Management Plan, Emergency Response Plan, Emergency Action Plan, etc.). This practice has been continued for the 2014 LMS.
- *Hazards Identification Scoring*  
Each jurisdiction reviewed the hazards scores that were included in the 2009 LMS (Comparison of Jurisdictional Relative Risk) and modified the scores for each hazard to reflect changes in the impacted area; probability of occurrence; and affects to the built and natural environment and economy.
- *Goals and Objectives*  
During a facilitated discussion at the Mitigation Strategy Meeting, the LMS Working Group reviewed the goals and objectives and deemed them to still be appropriate. As such, no changes were made.
- *Vulnerability Assessment*  
The Vulnerability Assessment was updated using HAZUS and MEMPHIS data, as well as the most recent local parcel data (August, 2014) for GIS analysis. Hazard maps, hazards exposure and loss estimates were also included. See Sections 4, 5 and 6 for further information.
- *Hazard Mitigation Initiatives*  
The LMS Working Group decided to continue to use the Excel-based mitigation initiative status and scoring system. The consultant provided a proposed system that was reviewed and modified by the LMS Working Group. See Section 9 for further information.
- *LMS Working Group Bylaws and Operating Procedures*  
The LMS Working Group updated the Bylaws and Operating Procedures with the facilitated assistance from the consultant with changes made since the 2009 LMS update.

Additionally, a Capability Assessment was prepared, which was not included in the 2005 LMS. This assessment remains and has been updated for the 2014 LMS.

The process used to update this LMS included:

- Conducted the Preliminary Meeting with Volusia County Emergency Management to establish planning process, roles, responsibilities, etc. in preparation for the Kickoff Meeting.
- Conducted the Kickoff Meeting with the Volusia Prepares LMS Working Group
- Offered Kickoff Meeting for the general public
- Developed the Vulnerability Assessment
- Developed the Capability Assessment

## SECTION 2: PLANNING PROCESS

- Conducted two Mitigation Strategy Workshops with the Volusia Prepares LMS Working Group and invited the general public to attend. The first meeting focused on the plan outline and data collection process and the second focused on review of the first draft of the updated 2014 plan.
- Developed the Mitigation Strategy
- Developed a new tracking and scoring system for the Mitigation Initiatives
- Updated the Mitigation Initiatives status and scoring of potential projects
- Updated the LMS Plan Maintenance process

Each of these planning steps resulted in critical work products and outcomes that collectively make up the Plan. These elements have been included as separate sections of the Plan (further described in Section 1: Introduction).

The jurisdictions will consider using content from the LMS into other planning initiatives.

### 2.4 VOLUSIA PREPARES LOCAL MITIGATION STRATEGY WORKING GROUP

In order to guide the development of this Plan, Volusia County reconvened its Volusia Prepares LMS Working Group that was created under past planning efforts. Since the 2009 update, some changes have been made to the LMS working group in terms of personnel. The LMS Working Group includes representatives of various public, private and non-profit organizations throughout the county. The LMS Working Group represents a community-based planning team made up of local government officials and other key stakeholders identified to serve as critical partners in the planning process.

Opportunities were provided for all Volusia County jurisdictions, agencies, businesses, academia and other interested parties to participate in the LMS update process. All Volusia Prepares information is emailed out to over 125 city managers, business owners, chambers of commerce, agencies, non-profits, emergency managers and other county LMS coordinators.

Several non-profits (e.g., American Red Cross, Volusia Interfaiths/Agencies Networking in Disaster and United Cerebral Palsy) participated in the LMS update process and have approved initiatives in the LMS. There is a Volusia Prepares Business group that has developed a Business Operations Center and emergency business database. They've also held several business planning workshops.

Beginning in June 2014, the Volusia County Prepares LMS Working Group members engaged in regular discussions as well as local meetings and planning workshops to discuss and complete tasks associated with preparing the Plan. This working group coordinated together on all aspects of plan preparation and provided valuable input to the process. In addition to regular meetings, committee members routinely communicated and were kept informed through a e-mail distribution list and Internet Web site.

Specifically, the tasks assigned to the LMS Working Group members included:

- Participate in LMS update meetings and workshops.
- Provide best available data as required for the risk assessment portion of the Plan.
- Help complete the local Capability Assessment Survey and provide copies of any mitigation or hazard-related documents for review and incorporation into the Plan.
- Support the development of the Mitigation Strategy, including the design and adoption of community goal statements.

## SECTION 2: PLANNING PROCESS

- Help design and propose appropriate mitigation actions for their department/agency for incorporation into the Mitigation Action Plan. Provide a status update and assign a priority score to existing Mitigation Actions.
- Review and provide timely comments on all study findings and draft plan deliverables.
- Support the adoption of the 2014 Volusia County Multi-jurisdictional Local Mitigation Strategy by all participating jurisdictions.

**Table 2.1** lists the members of the Volusia County Prepares LMS Working Group who were responsible for participating in the development of the Plan.

TABLE 2.1: Volusia County Prepares LMS Working Group		
NAME	JURISDICTION	Email
Ray Parkhurst	American Red Cross	<a href="mailto:Ray.parkhurst@redcross.org">Ray.parkhurst@redcross.org</a>
Richard Karl	Daytona Beach Intl Airport/Economic Dev	<a href="mailto:rkarl@volusia.org">rkarl@volusia.org</a>
Kimberly Dixon	Daytona Beach	<a href="mailto:dixonk@dbpd.us">dixonk@dbpd.us</a>
William Rotella	Daytona Beach Shores	<a href="mailto:wrotella@cityofdb.org">wrotella@cityofdb.org</a>
Alan Williamson	DeBary – VP Chair	<a href="mailto:awilliamson@debary.org">awilliamson@debary.org</a>
Maria Becker	DeLand	<a href="mailto:greboszm@deland.org">greboszm@deland.org</a>
Dept. Fire Chief Bob Rogers	Deltona	<a href="mailto:rrogers@deltonafl.gov">rrogers@deltonafl.gov</a>
Tyna Lynn Hilton	Edgewater	<a href="mailto:thilton@cityofedgewater.org">thilton@cityofedgewater.org</a>
Steve Juengst	Holly Hill	<a href="mailto:sjuengst@hollyhillfl.org">sjuengst@hollyhillfl.org</a>
Jason Yarborough	Lake Helen	<a href="http://jyarborough@lakehelen.com">jyarborough@lakehelen.com</a>
Lt. Randy Wright	New Smyrna Beach	<a href="mailto:rwright@cityofnsb.com">rwright@cityofnsb.com</a>
Kohn Evans	Oak Hill	<a href="mailto:evansk@oakhillfl.com">evansk@oakhillfl.com</a>
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Carmen Spelozzi	Pierson	<a href="mailto:carmen@townofpierson.org">carmen@townofpierson.org</a>
Robert Bailey	Ponce Inlet	<a href="mailto:rbailey@ponce-inlet.org">rbailey@ponce-inlet.org</a>
Kent Donahue	Port Orange	<a href="mailto:kdonahue@port-orange.org">kdonahue@port-orange.org</a>
Jeanne Willard	South Daytona	<a href="mailto:jwillard@southdaytona.org">jwillard@southdaytona.org</a>
Larry LaHue	Volusia County Emergency Management	<a href="mailto:llahue@volusia.org">llahue@volusia.org</a>
Pat White	Volusia County EM/VP Coordinator	<a href="mailto:pwhite@volusia.org">pwhite@volusia.org</a>
Tom Carey	Volusia County Environmental Mgmt.	<a href="mailto:tcarey@volusia.org">tcarey@volusia.org</a>
Bobbie King	Volusia County Fire Dept./Public Protection	<a href="mailto:BGKing@volusia.org">BGKing@volusia.org</a>
Nancy Church	Volusia County IT	<a href="mailto:nchurch@volusia.org">nchurch@volusia.org</a>
John Gamble	Volusia County Public Works	<a href="mailto:jgamble@volusia.org">jgamble@volusia.org</a>
Greg Akin	Volusia County School Board	<a href="mailto:GPAkin@volusia.k12.fl.us">GPAkin@volusia.k12.fl.us</a>
Chip Kent	Volusia County School Board	<a href="mailto:cnkent@volusia.k12.fl.us">cnkent@volusia.k12.fl.us</a>
Warren Greenberg	Volusia ARES	<a href="mailto:ae4wg@cfl.rr.com">ae4wg@cfl.rr.com</a>
Linda Breum	Bert Fish Hospital New Smyrna Beach	<a href="mailto:Linda.Breum@bertfish.com">Linda.Breum@bertfish.com</a>
Stephen Cantwell	Florida Hospital Orange City	<a href="mailto:Stephen.Cantwell@fhfm.org">Stephen.Cantwell@fhfm.org</a>
Margaret Epting	Florida Hospital Ormond Beach	<a href="mailto:Margaret.epting@fhms.org">Margaret.epting@fhms.org</a>

## SECTION 2: PLANNING PROCESS

**TABLE 2.1: Volusia County Prepares LMS Working Group**

NAME	JURISDICTION	Email
Ashley Fisher	Halifax Medical Center	<a href="mailto:Ashley.Fisher@halifax.org">Ashley.Fisher@halifax.org</a>
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Chip Schelble	Florida Health Department - Volusia	<a href="mailto:Chip_Schelble@flhealth.gov">Chip_Schelble@flhealth.gov</a>
Denise Hutchinson	Women's Council of Realtors	<a href="mailto:denisehutchinson@adamscameron.com">denisehutchinson@adamscameron.com</a>
Charlie Howell	Career Source Flagler Volusia	<a href="mailto:charliehowell@careersourcefv.com">charliehowell@careersourcefv.com</a>

### 2.5 COMMUNITY MEETINGS AND WORKSHOPS

The preparation of this Plan required a series of meetings and workshops for facilitating discussion, gaining consensus and initiating data collection efforts with local government staff, community officials and other identified stakeholders. More importantly, the meetings and workshops prompted continuous input and feedback from relevant participants throughout the drafting stages of the Plan. Below is a summary of the key meetings and community workshops held during the development of the plan update. In many cases, routine discussions and additional meetings were held by local staff to accomplish planning tasks specific to their department or agency, such as the approval of specific mitigation actions for their jurisdiction, department or agency to undertake and include in the Mitigation Action Plan.

The following is a summary of the meetings that occurred during the LMS update planning process. Meeting invitations, agendas, minutes and rosters are provided in Appendix D.

#### **Volusia Prepares Kickoff Meeting**

*June 11, 2014*

The Kickoff Meeting was held at the Volusia County Lifeguard Headquarters and Administration Center and was attended by the LMS Working Group. The primary purpose of the meeting was to explain the proposed planning process in detail, describe individual roles and responsibilities and begin initial data collection efforts. Discussions focused the key objectives, project tasks, schedule and staffing. The LMS Working Group was asked to identify additional stakeholders, new plans, data and studies to incorporate into the LMS update. The LMS Working Group was also presented with a proposed plan outline, to which they agreed. Each jurisdiction was asked to update their Hazards Identification (Comparison of Jurisdictional Relative Risk from 2009 LMS).

#### **Public Meeting and Draft Submittal**

*August 13, 2014*

The Public Meeting was held to inform the public of the planning process and the overall scope of the 2014 Volusia County Local Mitigation Strategy. Maps were provided to allow community members to mark their home locations, and general items within the plan were discussed. Special attention was given to community member needs and recommendations for the plan. This day was also utilized to submit a draft to all County and jurisdictional representatives.

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### **Volusia Prepares Meeting #2**

*September 10, 2014*

The Mitigation Strategy Meeting was held at the Volusia County Lifeguard Headquarters and Administration Center. The purpose of this meeting was to discuss and determine how to incorporate review comments that were provided by the LMS Working Group. Each jurisdiction also identified edits to the critical facilities that were included in the vulnerability assessment.

## **2.6 INVOLVING THE PUBLIC AND IDENTIFIED STAKEHOLDERS**

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The public and community stakeholders were invited to one pure “Public Meeting” (August 13) during the LMS planning process (see Appendix D), and were also invited to the Volusia Prepares meetings conducted on June 11<sup>th</sup> and September 10<sup>th</sup>. A press release was issued from Volusia County Community Information, by the Volusia County Public Information Officer, to invite the public to participate in the LMS development and provide comments on the LMS. The press release included background information about the LMS process, the agenda topics, date, time and location information. Public feedback would have been received by emails, at meetings, or by contacting the LMS Coordinator. However, to-date, no public comments have been received. In addition, the LMS was also placed on the Volusia County Emergency Management’s Website: <http://www.volusia.org/emergency/>.

As listed in Table 2.1, the LMS Working Group includes representation from various stakeholders in the community, in addition to the participating jurisdictions’ local government staff.

### **Public Meeting**

*August 13, 2014*

A public meeting was held on the evening of August 13, 2014 to inform the citizenry about the LMS update. The meeting was held at the City of Port Orange Public Library. Tim Kitchen, Kate Hardie, PJ Smith, Chris Chagdes and Amanda Webb from the ECFRPC provided an overview of hazard mitigation and brief description of the process involved in updating the LMS. Public Participation surveys were available at the meeting.

### **Volusia Prepares Meetings (2)**

June 11, 2014 and September 20, 2014

As noted above, the public was also invited to the two Volusia Prepares meetings held on June 11, 2014 and September 10, 2014.

## SECTION 3 – COMMUNITY PROFILE

This section of the Plan provides an overview of Volusia County, Florida. It consists of the following five subsections:

- ▶ **Geography and the Environment**
- ▶ **Population and Demographics**
- ▶ **Housing, Infrastructure and Land Use**
- ▶ **Employment and Industry**
- ▶ **Development Trends**

### 3.1 GEOGRAPHY AND THE ENVIRONMENT

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Volusia County was established in 1854 as a prosperous steamboat landing area. It lies on the central coast of eastern Florida and is comprised of 1,103 square miles of land and 329 square miles of water (bounded to the north and south by the coastal counties of Flagler and Brevard). Several counties border Volusia County to the west including Putnam, Marion, Lake and Seminole. The County is located approximately 40 miles from Orlando, 95 miles from Jacksonville and 105 miles from Tampa, Florida.

There are 16 incorporated areas within Volusia County, of which Deltona is the largest in terms of population. An orientation map of the Volusia County study area is provided as **Figure 3.1**. The participating jurisdictions in this plan include Daytona Beach, Daytona Beach Shores, DeBary, Del and Deltona, Edgewater, Holly Hill, Lake Helen, New Smyrna Beach, Oak Hill, Orange City, Ormond Beach, Pierson, Ponce Inlet, Port Orange, South Daytona, and the unincorporated area of Volusia County.

Forest land accounts for approximately 56 percent of the land area in Volusia County<sup>1</sup>. There is an abundance of public land in Volusia County. For example, the northern portion of the county, abutting Flagler County, is located in the North Peninsula State Recreation Area. In addition, the southern coastal portion of the county, adjacent to Brevard County, is part of the Canaveral National Seashore.

The climate in Volusia County is considered sub-tropical with generally warm, humid temperatures year-round. The average winter temperature is 62 degrees Fahrenheit. The average summer temperature is 81 degrees Fahrenheit, though it typically exceeds 90 degrees Fahrenheit in the months of June, July, and August. The average annual precipitation is 49 inches.

The dominant surface water resources in Volusia County are Mosquito Lagoon, Lake George (37,884 acres), Lake Monroe (5,423 acres), and Lake Harney (3,210 acres)<sup>2</sup>. There are many other water areas throughout the County, which are fed by numerous creeks, bayous and other minor tributaries.

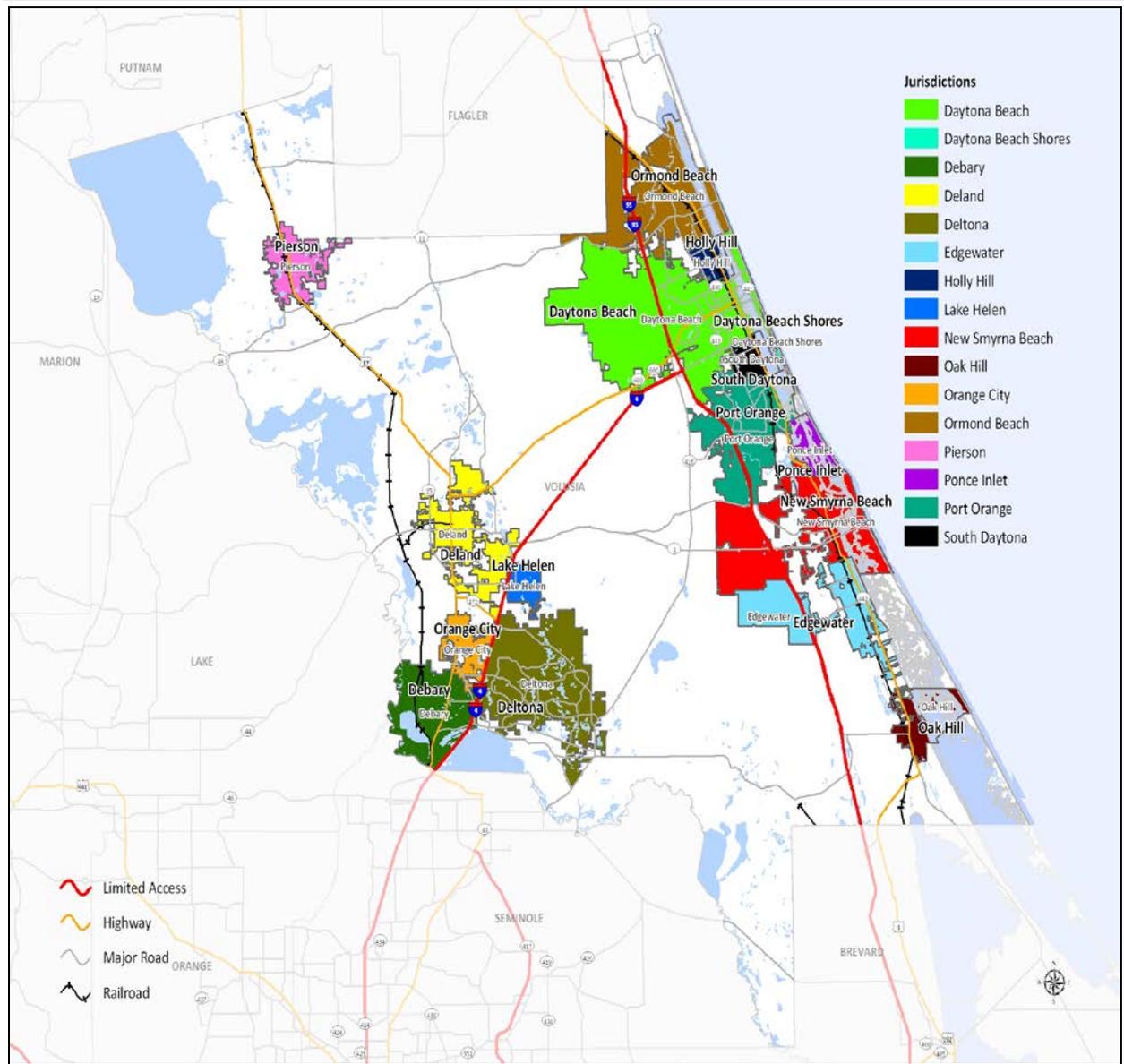
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<sup>1</sup> <http://www.freshfromflorida.com>

<sup>2</sup> Volusia County Comprehensive Plan, Figure 1-2 Legend for Water Bodies

**SECTION 3: COMMUNITY PROFILE**

**FIGURE 3.1: Volusia County Study Area Map**



Source: Volusia County GIS

### 3.2 POPULATION AND DEMOGRAPHICS

According to the U.S. Census Bureau, the 2012 estimated population of Volusia County was 495,581. This represents a 0.2 percent increase from 2010, when the population was 494,593, and a slightly lower change compared to the State percent change of 2.7 percent. **Table 3.1** provides the 2010 populations of the cities and unincorporated areas within Volusia County along with the 2012 population estimates as provided by the U.S. Census Bureau and the Volusia County Department of Economic Development. In addition, **Figure 3.2** shows the population distribution by block group in Volusia County.

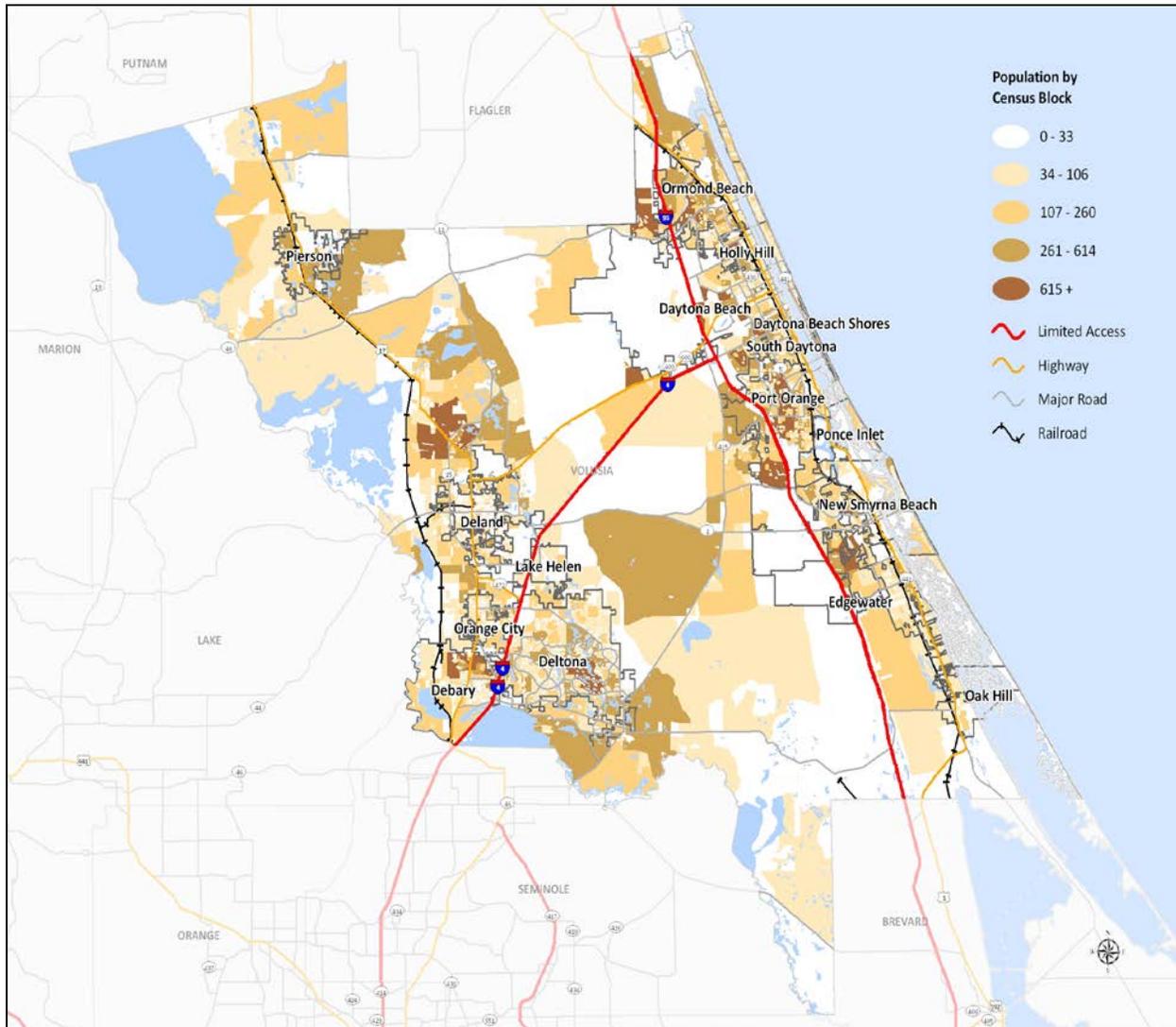
**TABLE 3.1: Population of Cities and Unincorporated Areas in Volusia County**

JURISDICTION	2010 POPULATION	2012 POPULATION ESTIMATE
Daytona Beach	61,005	61,779
Daytona Beach Shores	4,247	4,275
DeBary	19,320	19,246
DeLand	27,031	27,013
Deltona	85,182	85,593
Edgewater	20,750	20,796
Holly Hill	11,659	11,730
Lake Helen	2,624	2,638
New Smyrna Beach	19,537	22,658
Oak Hill	1,792	1,918
Orange City	10,599	10,653
Ormond Beach	38,137	38,372
Pierson	1,736	1,712
Ponce Inlet	3,032	3,034
Port Orange	56,048	56,242
South Daytona	12,252	12,388
Unincorporated	119,642	116,154

Source: U.S. Census Bureau

## SECTION 3: COMMUNITY PROFILE

Figure 3.2: Population of Cities and Unincorporated Areas in Volusia County



Source: U.S. Census Bureau

According to the 2012 U.S. Census American Community Survey, the median age for the County was 45.3 years. This is slightly higher than the Florida median age of 40.8 years of age. It is estimated that 21.3 percent of the County's population is made up of persons that are 65 years old and over, which is expectedly higher than the State figure of 17.5 percent.

The racial mix in Volusia County is predominately white, but has other notable populations. White persons make up 82.2 percent of the County's population. Black or African American persons accounted for 10.4 percent of the Volusia County population, less than the state percentage of 15.9 percent. Asians comprised 1.6 percent of the population compared to the State's 2.5 percent. People of Hispanic or Latino descent comprised 11.3 percent of the population in the County.

### 3.3 HOUSING, INFRASTRUCTURE, AND LAND USE

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#### 3.3.1 Housing

According to the Census Bureau's 2012 American Community Survey, there were 253,924 housing units in Volusia County. Of these structures, 69.3 percent are single-unit and 21.5 percent are multi-unit. The remaining 9.2 percent are mobile homes or other types of housing. The median value of owner-occupied housing units was \$158,900, compared to the \$170,800 average in Florida and the \$181,400 national average.

#### 3.3.2 Infrastructure

Infrastructure is categorized in this Plan as Transportation and Utilities, as these elements are vital in a disaster event, both for evacuation and for response and recovery efforts. Volusia County is endowed with multi-modes of transportation and has several utility providers.

##### *Transportation*

Volusia County has several transportation options whether traveling by automobile, rail, or air. There are two federal interstates which run through the County: Interstate 95 runs north to south along the coast, and Interstate 4 runs northeast, connecting the County to Orlando, and merging with I-95 near Daytona Beach. There are also four federal highways (U.S. 1, U.S. 17, U.S. 40 and U.S. 92). There are also four major railway transportation providers (Amtrak, CSX, Florida East Coast Railway, and SunRail), and a number of regional airports. The major area airport is Daytona Beach International Airport. In addition, Port Canaveral, a deep water port, and one of the busiest cruise ports in the world, is located about 70 miles south of Volusia County in Brevard County.

##### *Utilities*

Florida Power and Light, Progress Energy, City of New Smyrna Beach Utilities Commission, and Clay Electric Cooperative serve the electricity needs in Volusia County. The natural gas suppliers are Florida Public Utilities and TECO People's Gas. Water and sewer services are provided by a number of different sources including Volusia County Utilities, North Peninsula Utilities Corporation, and municipal governments.

## SECTION 3: COMMUNITY PROFILE

### 3.3.3 Land Use

**Table 3.2** shows the remaining vacant residential, vacant commercial and vacant industrial land available for development in Volusia County as of 2014. A majority of the jurisdictions plan to use the remaining open space for residential development.

**TABLE 3.2: Vacant Land in Volusia County**

JURISDICTION	VACANT RESIDENTIAL	VACANT COMMERCIAL	VACANT INDUSTRIAL
Daytona Beach	1,089 Acres	1,194 Acres	178 Acres
Daytona Beach Shores	11 Acres	21 Acres	-
DeBary	673 Acres	196 Acres	12 Acres
DeLand	1,428 Acres	333 Acres	120 Acres
Deltona	1,588 Acres	587 Acres	238 Acres
Edgewater	457 Acres	189 Acres	300 Acres
Holly Hill	117 Acres	46 Acres	33 Acres
Lake Helen	677 Acres	64 Acres	9 Acres
New Smyrna Beach	909 Acres	702 Acres	53 Acres
Oak Hill	-	-	-
Orange City	510 Acres	269 Acres	94 Acres
Ormond Beach	792 Acres	466 Acres	76 Acres
Pierson	585 Acres	76 Acres	-
Ponce Inlet	119 Acres	18 Acres	-
Port Orange	522 Acres	481 Acres	38 Acres
South Daytona	72 Acres	85 Acres	25 Acres
Unincorporated Area	39,820 Acres	1,048 Acres	359 Acres

## 3.4 EMPLOYMENT AND INDUSTRY

Volusia County began as prosperous steamboat landing town in the early 1800s. Today, employment is based largely in the public sector. According to the 2014 Area Workforce Report, the civilian labor force in Volusia County is approximately 251,400. The top employer is Volusia County Schools with 7,503 employees, Halifax Health with 4,709 employees, and Volusia County Government with 3,341 employees.

From an industry perspective, Volusia County has a high number of retail trade establishments (1,997), construction businesses (1,693; down from 2,495 in 2007), and professional, scientific and technical service businesses (1,475 establishments)<sup>3</sup>. These figures reflect the high proportion of people working in the construction, education, and tourism industries. The industries that received the highest average annual wages were management of companies and enterprises (\$104,836), utilities (\$81,258), and finance and insurance (\$48,042).

<sup>3</sup> Volusia County, Department of Economic Development (2012).

## SECTION 3: COMMUNITY PROFILE

In 2013, the estimated median household income for Volusia County was \$41,064, less than the State and U.S. medians of \$44,894 and \$51,314, respectively. Income in Volusia is projected to rise to \$49,476 in 2018.

### 3.5 DEVELOPMENT TRENDS

Volusia County experienced substantial growth between 2000 and 2005 followed by a sharp decline in growth between 2009 and 2012, as indicated by U.S. Census residential building permit data. Growth has started to rebound in 2013 (**Table 3.3**).

**TABLE 3.3: Annual Residential Building Permit Data, Volusia County**

YEAR	SINGLE FAMILY UNITS	MULTI-FAMILY UNITS	TOTAL
2000	3,088	59	3,147
2001	5,033	79	5,112
2002	4,131	40	4,171
2003	5,033	79	5,112
2004	4,820	100	4,920
2005	5,068	118	5,186
2006	2,906	55	2,961
2007	1,520	57	1,577
2008	1,031	22	1,053
2009	586	14	600
2010	639	14	653
2011	513	26	539
2012	760	0	760
2013	1,290	17	1,307

Source: U.S. Census Bureau

Currently, one major development planned in unincorporated Volusia County is scheduled. The Farmton Local Plan property is a development of regional impact (DRI) located south of Edgewater and west of I-95 to the Brevard County Line. It is approximately 47,000 acres, of which more than 30,000 acres are protected by conservation easements and covenants. The plan established two future land use designations; Green Key and Sustainable Development Area (SDA) with a maximum development potential of 23,100 dwelling units and 4,700,000 square feet of nonresidential building area. The plan became effective on March 29, 2012<sup>4</sup>.

For a list of new developments in Volusia County please visit the Land Development section of the Volusia County Growth and Resource Management Department website at the following link: <http://www.volusia.org/services/growth-and-resource-management/planning-and-development/land-development/>

<sup>4</sup> Volusia County Growth and Resource Management

## SECTION 4 – HAZARD IDENTIFICATION

This section is the first of three sections that assess the risk of Volusia County and the participating jurisdictions to natural hazards. This section identifies a wide range of hazards that could potentially impact the County. Section 5: **Hazard Profiles**, provides more detailed information about how the identified hazards specifically impact the County and participating jurisdictions. Section 6: **Vulnerability Assessment** provides detailed analyses results that indicate the amount of damages that could occur in the County as a result of the identified hazards. Together, these sections serve to identify, analyze and assess the overall risk posed to Volusia County and the participating jurisdictions from hazards. The risk assessment also attempts to define any hazard risks that may uniquely or exclusively affect specific areas of Volusia County or its participating jurisdictions and partners.

Volusia County and the participating jurisdictions are vulnerable to a wide range of natural hazards<sup>1</sup> that threaten life and property. Upon a review of the full range of natural hazards suggested under FEMA planning guidance, Volusia County and the participating jurisdictions have identified a number of hazards that are to be addressed in this Multi-jurisdictional LMS. These hazards were identified through an extensive process that utilized input from the Local Mitigation Strategy Working Group (LMS Working Group) members, research of past disaster declarations in the County, a review of previous hazard mitigation plans in the County, and a review of the current Florida Hazard Mitigation Plan. Readily available online information from reputable sources such as federal and state agencies was also evaluated to supplement information from these key sources.

**Table 4.1** lists the full range of natural hazards initially identified for consideration in the Plan and provides a brief description for each. This table includes thirteen individual hazards categorized by the following types: atmospheric, hydrologic, geologic, and other. Some of these hazards are considered to be interrelated or cascading (i.e., hurricanes can cause flooding, storm surge and tornadoes), but for preliminary hazard identification purposes these distinct hazards are broken out separately. It should also be noted that some hazards, such as drought or winter storms may impact a large area yet cause little damage, while other hazards, such as a tornado, may impact a small area yet cause extensive damage.

**TABLE 4.1: Descriptions of the Full Range of Initially Identified Hazards**

HAZARD	DESCRIPTION
<b>ATMOSPHERIC</b>	
<b>Hail</b>	A hail event is caused by any storm that produces hailstones that fall to the ground; usually used when the amount or size of the hail is considered significant. Hail is formed when updrafts in thunderstorms carry raindrops in to parts of the atmosphere where the temperatures are below freezing.

<sup>1</sup> FEMA's current regulations and interim guidance under the Disaster Mitigation Act of 2000 (DMA 2000) require, at a minimum, an evaluation of a full range of natural hazards. An evaluation of human-caused hazards (e.g., technological hazards, terrorism, etc.) is encouraged, though not required, for plan approval. Volusia County has focused solely on natural hazards at this time. Incorporation of human-caused hazards may be evaluated in future versions of the plan, as it is a "living document" which will be monitored, evaluated and updated regularly.

## SECTION 4: HAZARD IDENTIFICATION

**TABLE 4.1: Descriptions of the Full Range of Initially Identified Hazards**

HAZARD	DESCRIPTION
<b>Hurricane and Tropical Storm Wind</b>	<p>Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and with a diameter averaging 10 to 30 miles across. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves and tidal flooding which can be more destructive than cyclone wind. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season, which extends from June through November.</p>
<b>Lightning</b>	<p>Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder. On average, 73 people are killed each year by lightning strikes in the United States.</p>
<b>Severe Winter Storm</b>	<p>Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.</p>
<b>Thunderstorm</b>	<p>Thunderstorms are caused by air masses of varying temperatures meeting in the atmosphere. Rapidly rising warm moist air fuels the formation of thunderstorms. Thunderstorms may occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours.</p>
<b>Tornado</b>	<p>A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size and duration of the storm.</p>
<b>HYDROLOGIC</b>	
<b>Coastal Erosion</b>	<p>Landward displacement of a shoreline caused by the forces of waves and currents define coastal erosion. Coastal erosion is measured as the rate of change in the position or horizontal displacement of a shoreline over a period of time. It is generally associated with episodic events such as hurricanes and tropical storms, nor’easters, storm surge and coastal flooding but may also be caused by human activities that alter sediment transport. Construction of shoreline protection structures can mitigate the</p>

## SECTION 4: HAZARD IDENTIFICATION

**TABLE 4.1: Descriptions of the Full Range of Initially Identified Hazards**

HAZARD	DESCRIPTION
	hazard, but may also exacerbate it under some circumstances.
<b>Drought</b>	A drought is a prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. Human demands and actions have the ability to hasten or mitigate drought-related impacts on local communities.
<b>Flood</b>	The accumulation of water within a water body which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream ocean, lake or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine, coastal, or shallow flooding (which includes sheet flow, ponding, and urban drainage).
<b>Storm Surge</b>	A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to more than 30 feet in a Category 5 storm. Storm surge heights and associated waves are also dependent upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. Storm surge arrives ahead of a storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Storm surge can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast.
<b>GEOLOGIC</b>	
<b>Sinkhole</b>	Sinkholes are formed when the underlying limestone or other rock type collapses, resulting in a depression. Limestone is soluble in natural water, causing the collapse.
<b>Tsunami</b>	A series of waves generated by an undersea disturbance such as an earthquake. The speed of a tsunami traveling away from its source can range from up to 500 miles per hour in deep water to approximately 20 to 30 miles per hour in shallower areas near coastlines. Wave amplitudes in deep water are typically less than one meter; they are often barely detectable to the human eye. However, as they approach shore, they slow in shallower water, basically causing the waves from behind to effectively "pile up", and wave heights to increase dramatically. As opposed to typical waves which crash at the shoreline, tsunamis bring with them a continuously flowing 'wall of water'.
<b>OTHER</b>	
<b>Wildfire</b>	An uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors. Over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.
<b>Civil Disturbance ***</b>	Civil disturbances can occur due to socio-economic, political or other reasons. These

## SECTION 4: HAZARD IDENTIFICATION

**TABLE 4.1: Descriptions of the Full Range of Initially Identified Hazards**

HAZARD	DESCRIPTION
	types of events typically occur in public places, including court houses or town civic spaces.
<b>Coastal Oil Spill ***</b>	While oil spills would primarily affect the Gulf coast of Florida, oil spills can negatively affect tourism and ecological conditions on the Atlantic coast of Florida.
<b>Terrorism ***</b>	Terrorism includes any attempt to attack, cripple or damage public goods, public infrastructure or citizens on a large scale.
<b>Mass Migration ***</b>	Mass-migration occurs when persons of one geographic area move in large numbers to another geographic location.
<b>HazMat ***</b>	Hazardous material (HazMat) includes events when liquid, solid or gaseous chemicals that are harmful or fatal to humans or ecological infrastructure disperse into the atmosphere.
<b>Agro-terrorism ***</b>	Agro-Terrorism includes any attempt to maliciously destroy or harm the agricultural industry, the secondary effects of which can be disease, famine and massive economic loss.
<b>Public Health Emergencies ***</b>	Public health emergencies include medical surges (often from mass casualty events) that require hospitals to act beyond normal capacity. Pandemics are included in this category.
<b>Cyber Attack ***</b>	Cyber-attacks include the use of electronic devices to attack, cripple or damage information systems held by governmental or private institutions, as well as individual citizens.

\*\*\* SPECIAL NOTE: The following “man-made” hazards are analyzed in terms of the vulnerability they pose to the Volusia County community and the potential mitigation activities that can be implemented within [Section 7, Capability Assessment](#); [Section 9, Mitigation Action Plan](#); [Appendix H, HIRA Consequences](#), and; [Appendix J, Consequences by Hazard](#). These hazards are not analyzed for their vulnerability to the community within the Vulnerability Assessment (Section 6) of this document, as that section is limited to the hazards that can be analyzed utilizing Geographic Information Systems (GIS) on a county-wide basis.

## SECTION 5 – HAZARD PROFILES

### 44 CFR Requirement

#### **44 CFR Part 201.6(c)(2)(i):**

The risk assessment shall include a description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

### 5.1 OVERVIEW

This section includes detailed hazard profiles for each of the hazards identified in the previous section as significant enough for further evaluation through the risk assessment in Volusia County. This includes the following hazards:

- ▶ **Atmospheric**
  - Hail
  - Hurricane and Tropical Storm
  - Lightning
  - Severe Winter Storm
  - Thunderstorm
  - Tornado
- ▶ **Hydrologic**
  - Coastal Erosion
  - Drought
  - Flood
  - Storm Surge
- ▶ **Geologic**
  - Sinkhole
  - Tsunami
- ▶ **Other**
  - Wildfire
  - Cyber Attack
  - Civil Disturbance
  - Coastal Oil Spill
  - Terrorism
  - Mass Migration
  - HazMat
  - Agro-terrorism
  - Public Health Emergencies

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

## SECTION 5: HAZARD PROFILES

Each hazard profile described in this section includes a general description of the hazard, its location and extent, notable historical occurrences and the probability of future occurrences. It also includes specific items noted by members of the Local Mitigation Strategy Working Group (LMS Working Group) as it relates to unique historical or anecdotal hazard information for Volusia County or a particular jurisdiction. The probability of future occurrence is expressed as “high” (expected to occur at least every five years), “moderate” (expected to occur at least every 25 years), “low” (expected to occur at least every 100 years, and “very low” (is possible to occur, despite their being no recorded occurrences).

### Major Disaster Declarations

In 1988, the Robert T. Stafford Disaster Relief and Emergency Assistance Act was enacted to support state and local governments when disasters overwhelm local resources. This law, as amended, establishes a process for requesting and obtaining a Presidential Disaster Declaration, defines the type and scope of assistance available from the federal government, and sets the conditions for obtaining that assistance. The Federal Emergency Management Agency (FEMA), now part of the Emergency Preparedness and Response Directorate of the Department of Homeland Security, is tasked with coordinating the response. Since 1965, Volusia County has received numerous presidential disaster declarations for such hazards as hurricanes, tornados, floods and severe freezes (**Table 5.1**).

**TABLE 5.1: Presidential Disaster Declarations**

EVENT	DECLARATION DATE	DECLARATION NUMBER
Severe Storms, Tornadoes, and Flooding	05/15/79	586
Tornadoes, Flooding, High Winds & Tides, Freezing	03/13/93	982
Tropical Storm Gordon, Tornadoes, Flooding	11/28/94	1043
Tropical Storm Josephine	10/15/96	1141
Severe Storms, High Winds, Tornadoes, Flooding	02/25/98	1195
Extreme Fire Hazard	07/03/98	1223
Hurricane Floyd	09/22/99	1300
Hurricane Irene	10/28/99	1306
Severe Freeze	02/06/01	159
Hurricane Charlie/Bonnie	08/13/04	1539
Hurricane Frances	09/04/04	1545
Hurricane Ivan	09/15/04	1551
Hurricane Jeanne	09/26/04	1561
Hurricane Katrina Evacuation	09/05/05	3220
Severe Storms, Tornadoes	02/03/07	1679
Severe Storms, Tornadoes, and Flooding	02/08/07	1680
Tropical Storm Fay	08/21/08	3288
Severe Storms, Flooding, Tornadoes, Straight-line Winds	05/27/09	1840

Source: Federal Emergency Management Agency

## SECTION 5: HAZARD PROFILES

Volusia County Emergency Management has had 52 significant disaster events that resulted in the activation of their Emergency Operations Center. There were 73 percent that were natural hazard events, underscoring that natural hazards pose a very high risk to Volusia County. **Table 5.2** lists these events by type, area of impact, EOC activation level, the estimated number of parcels (properties) that were damaged and loss estimates.

**TABLE 5.2: Significant Activation Events**

Date of Event	Type Of Event	Area of Event	EOC Level Activation	Damage Estimate	
				# Parcels	Dollars
3/13/1993	Wind Storm	County-Wide	Level 2 (Part)	1273	16,948,355
5/4/1994	Tornado	Holly Hill	Level 2 (Part)	273	6,680,000
9/6/1994	I-4 Chemical Spill	SW Volusia	Level 1 (Mon)	N/A	N/A
11/17/1994	T.S. Gordon	County-Wide	Level 2 (Part)	658	10,602,924
8/3/1995	Hurricane Erin	Edgewater	Level 3 (Full)	31	65,052
3/11/1996	Wind Storm	Daytona Beach	Level 1 (Mon)	8	28,000
7/10/1996	Hurricane Bertha	County-Wide	Level 2 (Part)	N/A	N/A
9/5/1996	Hurricane Fran	County-Wide	Level 2 (Part)	N/A	N/A
10/8/1996	T.S. Josephine	County-Wide	Level 1 (Mon)	193	1,232,343
4/23/1997	Tornado	NSB Peninsula	Level 2 (Part)	79	525,600
7/5/1997	Tornado	Oak Hill	Level 1 (Mon)	6	33,000
11/2/1997	Tornado	NSB Main & Penn	Level 2 (Part)	318	11,070,722
2/2/1998	Wind Storm	Bethune Beach	Level 1 (Mon)	1	20,000
2/22/1998	Tornado	Daytona Beach	Level 2 (Part)	616	9,435,553
6/22/1998	Fire Storm "98"	County-Wide	Level 4 (Fullx)	22	2,126,013
7/28/1998	Tornado	Daytona Beach	Level 1 (Mon)	46	159,000
1/3/1999	Wind Storm	SR 415 Area	Level 1 (Mon)	8	9,100
1/9/1999	Wind Storm	Daytona Beach	Level 1 (Mon)	11	59,000
9/14/1999	Hurricane Floyd	East Side	Level 1 (Full)	433	18,655,353
10/16/1999	Hurricane Irene	East Side	Level 2 (Part)	185	16,809,266
1/1/2000	Y2K	County-Wide	Level 1 (Full)	N/A	N/A
5/31/2000	Wildfires 2000	County-Wide	Level 2 (Part)	N/A	N/A
9/16/2000	Hurricane Gordon	County-Wide	Level 2 (Part)	N/A	N/A
9/19/2000	Wind Storm	DeLand	Level 2 (Part)	18	68,836
3/13/2001	Tornado	Daytona Beach	Level 2 (Part)	172	3,210,995
9/11/2001	Nat'l Terrorism Event	County-Wide	Level 2 (Part)	N/A	N/A
9/14/2001	T.S. Gabrielle	County-Wide	Level 2 (Part)	44	474,135
11/15/2001	Rain Event	East Volusia	Level 2 (Part)	39	561,300
4/18/2002	Amtrak Derailment	Putnam Co.	Level 2 (Part)	N/A	5,000
9/4/2002	T.S. Edouard	County-Wide	Level 2 (Part)	N/A	N/A
1/13/2003	Water Plant Breach	Debary	Level 2 (Part)	N/A	30,000
7/3/2004	Pepsi 400 Dis Race	Daytona Beach	Level 2 (Part)	N/A	N/A
8/13/2004	Hurricane Charley	County-Wide	Level 1 (Full)	5719	106,900,000
9/4/2004	Hurricane Frances	County-Wide	Level 1 (Full)	26964	393,900,000
9/25/2004	Hurricane Jeanne	County-Wide	Level 1 (Full)	UNK	59,500,000
7/2/2005	Pepsi 400 Dis Race	Daytona Beach	Level 2 (Part)	N/A	N/A
9/8/2005	T.S. Ophelia	County-Wide	Level 2 (Part)	Beach	N/A

## SECTION 5: HAZARD PROFILES

**TABLE 5.2: Significant Activation Events**

Date of Event	Type Of Event	Area of Event	EOC Level Activation	Damage Estimate	
				# Parcels	Dollars
10/23/2005	Hurricane Wilma	County-Wide	Level 2 (Part)	3	752,000
2/19/2006	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	N/A
7/1/2006	Pepsi 400 Dis Race	Daytona Beach	Level 2 (Part)	N/A	N/A
8/29/2006	T.S. Ernesto	County- Wide	Level 2 (Part)	N/A	N/A
12/25/2006	Tornado	DeLand-Daytona Bch.	Level 3 (Mon)	210	32,000,000
2/2/2007	Tornado	DeLand-NSB	Level 2 (Part)	771	60,557,921
2/18/2007	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	N/A
5/6/2007	Airport Road Fire	Volusia/Flagler Co.	Level 2 (Part)	N/A	N/A
7/7/2007	Pepsi 400 Dis Race	Daytona Beach	Level 2 (Part)	N/A	N/A
2/17/2008	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	N/A
7/5/2008	Coke 400 Dis Race	Daytona Beach	Level 2 (Part)	N/A	N/A
8/18/2008	T.S. Fay	County-Wide	Level 1 (Full)	240	13,580,016
2/15/2009	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	N/A
5/17/2009	May Rain Storm	County-Wide	Level 2 (Part)	1654	69,516,703
7/7/2009	Coke Zero 400	Daytona Beach	Level 2 (Part)	N/A	N/A
7/24/2009	Port Orange Tornado	Port Orange	Level 3 (Monitor)	175	2,810,661
2/14/2010	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	
7/3/2010	Coke Zero 400	Daytona Beach	Level 2 (Part)	N/A	
2/20/2011	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	
2/28/2011	Iron Horse Fire (17,017 a.)	Volusia County	Level 3 (Monitor)	N/A	
5/26/2011	Volusia Command Fires	Volusia County	Level 3 (Monitor)	N/A	
6/2/2011	Coke Zero 400	Daytona Beach	Level 2 (Part)	N/A	
2/26-28/12	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	
7/7/2012	Coke Zero 400	Daytona Beach	Level 2 (Part)	N/A	
12/11-12/12	Tornado Terra Mar	Edgewater	Level 2 (Part)	N/A	1,692,498
2/24/2013	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	
3/2/2013	Durrance Fire	Ormond Beach	Level 3 (Monitor)	N/A	
6/6/2013	Tropical Storm Andrea	Countywide	Level 3 (Monitor)	N/A	
7/6/2013	Coke Zero 400	Daytona Beach	Level 2 (Part)	N/A	
2/23/2014	Daytona 500 Race	Daytona Beach	Level 2 (Part)	N/A	
7/1/2014	Tropical Storm Arthur	Countywide	Level 3 (Monitor)	N/A	
7/5-6/2014	Coke Zero 400	Daytona Beach	Level 2 (Part)	N/A	
			<b>Totals-----&gt;</b>	<b>40,170</b>	<b>840,019,346</b>

Source: Volusia County Emergency Management Division (Revised 8/10/14)

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

# ATMOSPHERIC HAZARDS

## 5.2 HAIL

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### 5.2.1 Background

Hail frequently accompanies thunderstorms and has potential to cause substantial damage. Early in the developmental stages of a hail, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop sufficient weight to fall as precipitation. Hail precipitation falls in sphere or irregularly shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size.

### 5.2.2 Location and Spatial Extent

Hail is often produced during a thunderstorm event which has no geographic limitations to the area it affects. Therefore, it is assumed that all of Volusia County is uniformly at risk to a hail event. Impacts typically include downed power lines and trees and damage to vehicles and mobile homes. Hail is a form of solid precipitation consisting of balls or irregular lumps of ice .5 millimeters or larger that form during certain thunderstorm conditions. In terms of extent for Volusia County, tennis ball-sized hail (2.5 inch diameter based on NOAA hail conversions) has been observed on many occasions within Volusia County and is a probable occurrence on an annual basis. Larger hail conditions are less likely, but possible. The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hail and that future mitigation and adaptation strategies related to this hazard should be considered.

### 5.2.3 Historical Occurrences

According to the National Climatic Data Center, there have been 131 recorded hail events in Volusia County since 1983, as shown in **Table 5.3**<sup>1</sup>. Hail has caused a total of \$231,092 in property damage, but has not resulted in any injuries or deaths. Hail sizes for these events range from 1.00 inches to 2.75 inches in diameter. The locations of historically recorded hail events are shown in **Figure 5.1**. The emergency management officials from the Volusia County jurisdictions determined that only hail that was greater than one inch in diameter was to be listed in **Table 5.3**.

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<sup>1</sup> A Hail event that affects several jurisdictions on the same day is classified as a single event.

## SECTION 5: HAZARD PROFILES

**TABLE 5.3: Historical Hail Impacts**

LOCATION	DATE	MAGNITUDE (inches)	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Volusia County	8/16/1963	1.00	0/0	\$0	Not Available
Volusia County	2/7/1971	2.75	0/0	\$0	Not Available
Volusia County	3/13/1971	1.75	0/0	\$0	Not Available
Volusia County	5/29/1971	1.75	0/0	\$0	Not Available
Volusia County	4/4/1973	1.00	0/0	\$0	Not Available
Volusia County	6/10/1975	1.75	0/0	\$0	Not Available
Volusia County	5/12/1976	1.50	0/0	\$0	Not Available
Volusia County	4/18/1978	1.00	0/0	\$0	Not Available
Volusia County	4/8/1982	1.50	0/0	\$0	Not Available
Volusia County	4/29/1982	1.75	0/0	\$0	Not Available
Volusia County	6/8/1985	1.00	0/0	\$0	Not Available
Volusia County	6/18/1987	1.75	0/0	\$0	Not Available
Volusia County	5/24/1988	1.50	0/0	\$0	Not Available
Volusia County	2/21/1989	1.00	0/0	\$0	Not Available
Volusia County	3/23/1989	1.25	0/0	\$0	Not Available
Volusia County	5/1/1989	1.00	0/0	\$0	Not Available
Volusia County	6/26/1990	1.00	0/0	\$0	Not Available
Volusia County	5/2/1992	1.00	0/0	\$0	Not Available
Edgewater	1/11/1993	1.50	0/0	\$77,700	Strong downburst winds damaged 9 mobile homes. Most had aluminum awnings, carports, and family rooms ripped away. Trees and power lines were downed. Up to golf ball-sized hail also fell.
Daytona Beach	3/31/1993	1.75	0/0	\$0	Golf ball-sized hail fell at the Daytona Beach Airport.
Daytona Beach	6/19/1995	2.50	0/0	\$36,809	Severe thunderstorms blew down dozens of trees in Deltona and produced one inch-diameter hail.
Daytona Beach	3/28/1996	1.75	0/0	\$0	Strong downburst winds blew down trees destroyed a pool screen and produced two and one-half-inch-diameter hail in the Spruce Creek

## SECTION 5: HAZARD PROFILES

**TABLE 5.3: Historical Hail Impacts**

LOCATION	DATE	MAGNITUDE (inches)	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
					Village.
Barberville	6/15/1996	1.00	0/0	\$0	Hail the size of quarters fell in Barberville, while quarter-sized hail fell in DeBary.
DeBary	6/15/1996	1.00	0/0	\$0	
Daytona Beach	8/25/1996	1.00	0/0	\$0	Not Available
Deltona	7/7/1997	1.00	0/0	\$0	Not Available
DeBary	8/13/1997	1.00	0/0	\$0	Not Available
Deltona	2/28/1998	1.00	0/0	\$0	Not Available
DeLand	3/20/1998	1.25	0/0	\$0	Not Available
New Smyrna Beach	3/20/1998	1.00	0/0	\$0	
Daytona Beach	6/25/1998	1.75	0/0	\$0	Not Available
Port Orange	1/9/1999	1.00	0/0	\$4,032	A few mobile homes were damaged by falling trees and quarter size hail in Port Orange.
Pierson	5/6/1999	1.75	0/0	\$0	Not Available
Orange City	5/9/1999	1.75	0/0	\$0	Not Available
Oak Hill	4/15/2000	1.00	0/0	\$0	Not Available
DeLand	9/19/2000	1.75	0/0	\$0	Not Available
Oak Hill	3/29/2001	1.00	0/0	\$0	Not Available
DeLand	3/31/2001	1.00	0/0	\$0	Not Available
New Smyrna Beach	8/21/2001	1.00	0/0	\$0	Not Available
Deltona	3/19/2003	1.00	0/0	\$0	Not Available
DeLand	4/25/2003	1.00	0/0	\$0	Not Available
DeLand	7/18/2003	1.00	0/0	\$0	Not Available
Oak Hill	7/21/2003	1.00	0/0	\$0	Not Available
DeLand	10/7/2003	1.00	0/0	\$0	Not Available
Port Orange	7/8/2004	2.00	0/0	\$0	Not Available
Maytown	10/19/2004	1.00	0/0	\$0	Not Available
Seville	3/25/2005	1.00	0/0	\$0	Not Available
Daytona Beach	5/4/2005	1.75	0/0	\$112,551	Not Available

## SECTION 5: HAZARD PROFILES

**TABLE 5.3: Historical Hail Impacts**

LOCATION	DATE	MAGNITUDE (inches)	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Holly Hill	6/28/2006	1.75	0/0	\$0	Not Available
DeLand	7/17/2006	1.00	0/0	\$0	Not Available
Glencoe	3/7/2008	1.00	0/0	\$0	A cold front moving across central Florida produced a line of thunderstorms that moved southeast across the area. One inch hail was reported in Port Orange. Quarter size hail was reported at Interstate 95 and Highway SR44, near Glencoe, and in Daytona Beach. The public reported nickel size hail in Deltona.
Port Orange	3/7/2008	1.00	0/0	\$0	
Daytona Beach	3/7/2008	1.00	0/0	\$0	
Seville	7/5/2008	1.00	0/0	\$0	Quarter-sized hail was reported. A sea breeze thunderstorm produced hail and wind gusts in interior parts of E.C.F.
Seville	6/13/2009	1.00	0/0	\$0	Numerous strong storms developed over east central Florida, with a few strengthening to severe levels and producing wind damage and large hail.
DeLeon Springs	3/31/2009	1.00	0/0	\$0	A northward-lifting warm front combined with active sea breeze boundaries within an unstable atmosphere produced several severe thunderstorms with nickel to quarter sized hail and localized severe winds.
Ponce Park	2/22/2010	1.00	0/0	\$0	Isolated thunderstorms developed in an unstable environment well ahead of a cold front. One of the storms became strong and produced small hail as it moved east out of the Ocala National Forest. The storm strengthened as it approached the coast, producing large hail on the barrier island east of central Daytona Beach.
Harbor Point	5/13/2011	1.00	0/0	\$0	The collision of the east and west coast sea breezes formed a broken line of thunderstorms across East Central Florida. A couple of these pulse storms became severe in Orange and Volusia Counties.
Ormond by the Sea	3/31/2011	1.00	0/0	\$0	A pre-frontal squall line moved rapidly across central Florida, bringing strong

## SECTION 5: HAZARD PROFILES

**TABLE 5.3: Historical Hail Impacts**

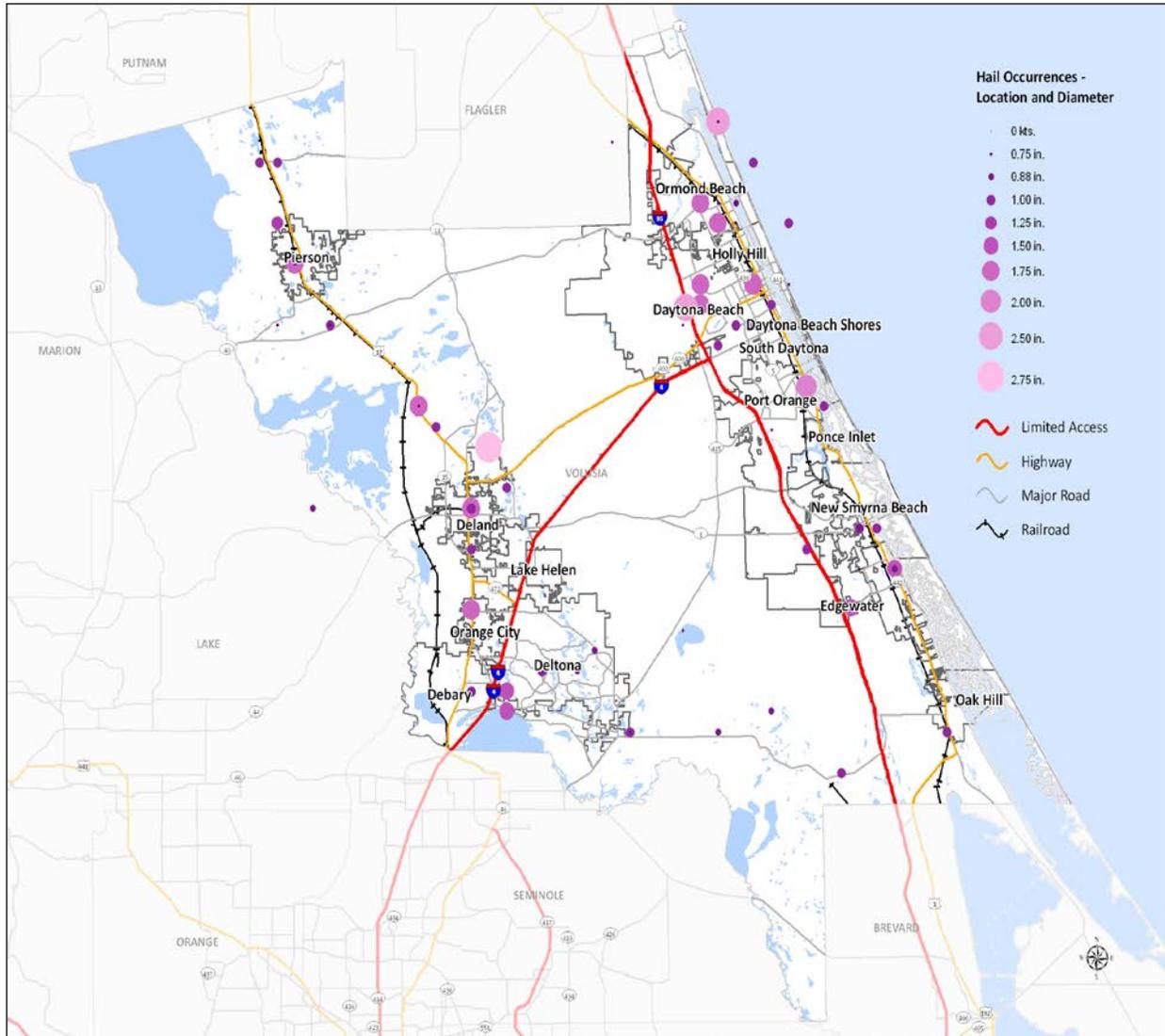
LOCATION	DATE	MAGNITUDE (inches)	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
					to severe thunderstorms with large hail and funnel clouds.
Glencoe	5/17/2012	1.75	0/0	\$0	The east coast sea breeze formed in the early afternoon and propagated inland, eventually colliding with the west coast sea breeze over the central peninsula. Storms moved to the east and northeast and produced large hail over Brevard and Volusia Counties.
Deltona	4/20/2012	1.75	0/0	\$0	Several severe thunderstorms occurred as low to mid-level southwest winds brought a warm and very moist air mass into east central Florida. Much cooler and drier air above this moisture laden air allowed for vigorous storm development which acted to produce severe wind gusts and hail in many of the thunderstorms that developed.
Barberville	4/20/2012	1.25	0/0	\$0	Several severe thunderstorms occurred as low to mid-level southwest winds brought a warm and very moist air mass into east central Florida. Much cooler and drier air above this moisture laden air allowed for vigorous storm development which acted to produce severe wind gusts and hail in many of the thunderstorms that developed.
DeBary	4/20/2012	1.00	0/0	\$0	Several severe thunderstorms occurred as low to mid-level southwest winds brought a warm and very moist air mass into east central Florida. Much cooler and drier air above this moisture laden air allowed for vigorous storm development which acted to produce severe wind gusts and hail in many of the thunderstorms that developed.
DeLand Osteen Glencoe	5/17/2012	0.75 (DeLand) 0.88 (Osteen) 1.75 (Glencoe)	0/0	\$0	The east coast sea breeze formed in the early afternoon and propagated inland, eventually colliding with the west coast sea breeze over the central peninsula. Storms moved to the ENE, producing large hail over Volusia County.

Source: National Climatic Data Center

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

# SECTION 5: HAZARD PROFILES

## FIGURE 5.1: Locations of Historical Hail Events in Volusia County



Source: National Climatic Data Center

### 5.2.4 Probability of Future Occurrences

Based on the frequency of hail events in the past, the probability of future hail occurrences in Volusia County is high. Over the past 45 years, Volusia County has been impacted by two or more hail events per year. It can be expected that future hail events will continue to cause minor to severe damage to property and vehicles throughout Volusia County.

## 5.3 HURRICANE AND TROPICAL STORM

### 5.3.1 Background

Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a “safety-valve,” limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with hurricanes and tropical storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves and tidal flooding which can be more destructive than cyclone wind.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September, and the average number of storms that reach hurricane intensity per year in this basin is about six.

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale (**Table 5.4**), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense<sup>2</sup>.

**TABLE 5.4: Saffir-Simpson Scale**

CATEGORY	MAXIMUM SUSTAINED WIND SPEED (MPH)	MINIMUM SURFACE PRESSURE (MILLIBARS)	STORM SURGE (FEET)
Tropical Storm	39–73	n/a	0–2
1	74–95	Greater than 980	3–5
2	96–110	979–965	6–8
3	111–129	964–945	9–12
4	130–156	944–920	13–18
5	157 +	Less than 920	19+

Source: National Hurricane Center

<sup>2</sup> Although a tropical storm is not part of the Saffir-Simpson Scale, it is listed here for comparative purposes.

## SECTION 5: HAZARD PROFILES

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure and storm surge potential, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified “major” hurricanes. Hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, but they account for over 70 percent of the damage in the United States. **Table 5.5** describes the damage that could be expected for a tropical storm and each category of hurricane. Damage during hurricanes may also result from spawned tornadoes, storm surge and inland flooding associated with heavy rainfall that usually accompanies these storms.

**TABLE 5.5: Hurricane Damage Classifications**

STORM CATEGORY	DAMAGE LEVEL	WIND SPEED	DESCRIPTION OF DAMAGES	PHOTO EXAMPLE
Tropical Storm	MINOR	39-73 mph	Breaks twigs and branches off trees, damages signboards, and windows may break.	
1	MINIMAL	74-95 mph	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	96-110 mph	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.	
3	EXTENSIVE	111-129 mph	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	EXTREME	130-156 mph	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	
5	CATASTROPHIC	157+ mph	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.	

Sources: National Hurricane Center; Federal Emergency Management Agency, Tropical Storm Photo: FEMA/George Armstrong; Other Photos: PBS&J Photo Library

### 5.3.2 Location and Spatial Extent

Hurricanes and tropical storms threaten the entire Atlantic and Gulf seaboard of the United States. Coastal areas are directly exposed to the brunt of a land-falling storm, but its impact is often felt hundreds of miles inland. Volusia County is susceptible to all of the hazards wrought by hurricanes and tropical storms. All areas throughout the county are susceptible to the accompanying hazard effects including extreme wind, flooding, and tornadoes. In addition, the coastal areas of the county are extremely susceptible to the added effects of storm surge, wave action, coastal erosion and tidal flooding<sup>3</sup>.

### 5.3.3 Historical Occurrences

According to NOAA historical storm track records, 90 hurricane or tropical storm tracks have passed within 75 miles of Volusia County since 1850.<sup>4</sup> This includes: zero (0) Category 5 hurricanes; three (3) Category 4 hurricanes; eight (8) Category 3 hurricanes; nine (9) Category 2 hurricanes; twenty-one (21) Category 1 hurricanes; and forty-nine (49) tropical storms. Of the recorded storm events, 25 had tracks that traversed directly through Volusia County. **Table 5.6** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 100 miles of Volusia County) and Category of the storm based on the Saffir-Simpson Scale. **Figure 5.3** shows the track of each recorded storm in relation to Volusia County and eastern Florida.

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hurricanes that future mitigation and adaptation strategies related to this hazard should be considered.

**TABLE 5.6: Historical Storm Tracks within 75 Miles of Volusia County (1850–2006)**

DATE OF OCCURRENCE	STORM NAME	MAXIMUM WIND SPEED (MPH)	STORM CATEGORY
10/20/1941	Not Named	35	Tropical Storm
10/19/1944	Not Named	65	Category 1 Hurricane
06/24/1945	Not Named	80	Category 1 Hurricane
09/16/1945	Not Named	110	Category 1 Hurricane
10/08/1946	Not Named	40	Tropical Storm
11/02/1946	Not Named	35	Tropical Storm
09/23/1947	Not Named	50	Tropical Storm
08/27/1946	Not Named	130	Category 4 Hurricane
09/06/1950	EASY	85	Category 2 Hurricane
10/18/1950	KING	75	Category 1 Hurricane
10/09/1953	HAZEL	55	Tropical Storm
09/11/1960	DONNA	105	Category 3 Hurricane

<sup>3</sup> Distinct hazard area locations for flooding, storm surge, and coastal erosion are discussed elsewhere in this section.

<sup>4</sup> These storm track statistics do not include tropical depressions or extratropical storms. Though these related hazard events are less severe in intensity, they may indeed cause significant local impact in terms of rainfall and high winds.

## SECTION 5: HAZARD PROFILES

**TABLE 5.6: Historical Storm Tracks within 75 Miles of Volusia County (1850–2006)**

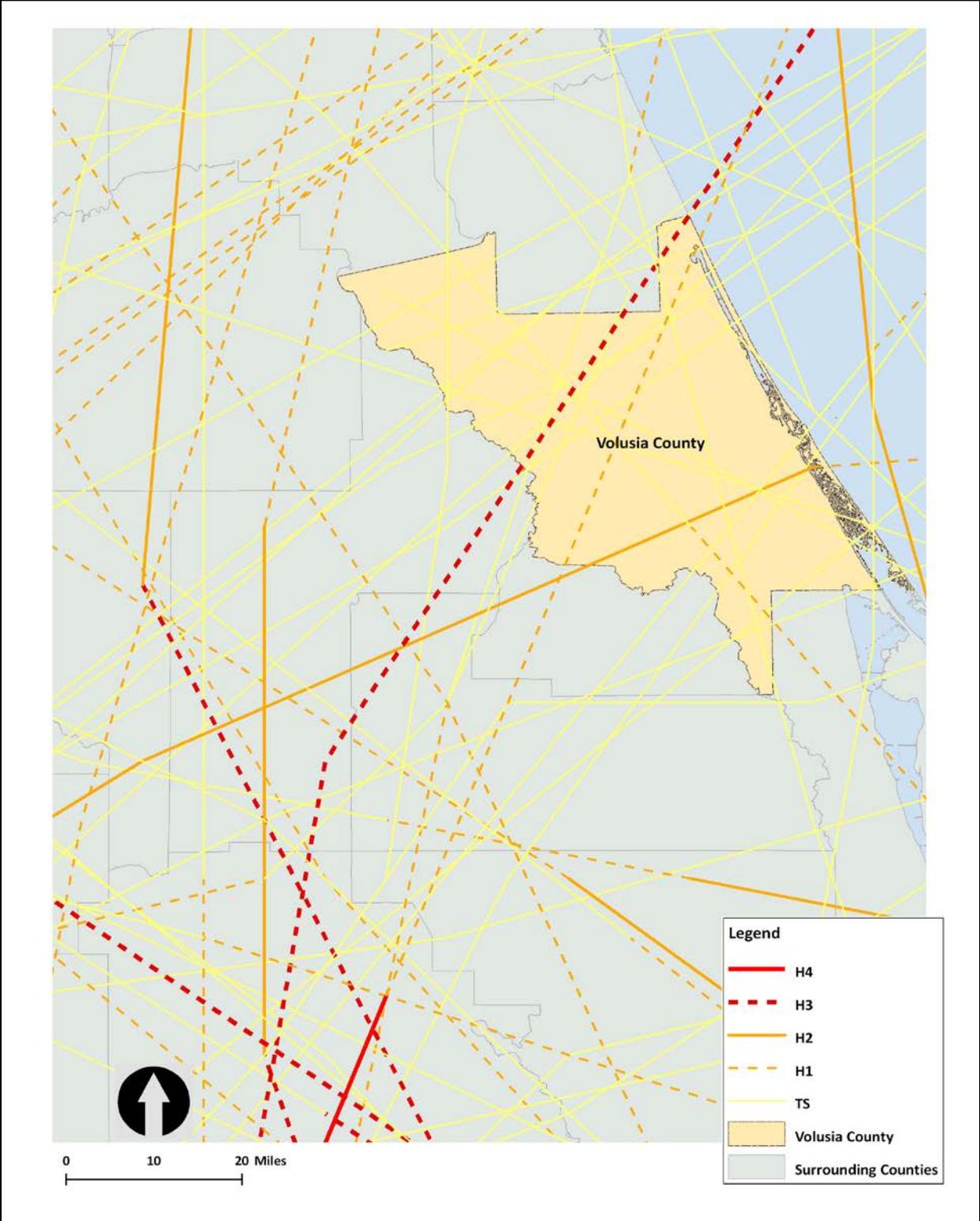
DATE OF OCCURRENCE	STORM NAME	MAXIMUM WIND SPEED (MPH)	STORM CATEGORY
08/27/1964	CLEO	75	Category 1 Hurricane
09/10/1964	DORA	100	Category 3 Hurricane
06/04/1968	ABBY	55	Tropical Storm
10/19/1968	GLADYS	70	Category 1 Hurricane
8/20/1976	DOTTIE	45	Tropical Storm
09/03/1979	DAVID	85	Category 2 Hurricane
09/04/1979	DAVID	85	Category 2 Hurricane
08/19/1981	DENNIS	40	Tropical Storm
08/25/1983	BARRY	40	Tropical Storm
09/10/1984	DIANA	60	Tropical Storm
09/28/1984	ISIDORE	45	Tropical Storm
07/24/1985	BOB	60	Tropical Storm
10/10/1985	ISABEL	45	Tropical Storm
08/28/1988	CHRIS	40	Tropical Storm
11/23/1988	KEITH	55	Tropical Storm
11/17/1994	GORDON	55	Tropical Storm
08/02/1995	ERIN	75	Category 1 Hurricane
08/24/1995	JERRY	35	Tropical Storm
10/16/1999	IRENE	65	Category 1 Hurricane
09/14/2001	GABRIELLE	60	Tropical Storm
08/13/2004	CHARLEY	125	Category 4 Hurricane
09/05/2004	FRANCES	80	Category 1 Hurricane
09/26/2004	JEANNE	95	Category 2 Hurricane
10/05/2005	TAMMY	45	Tropical Storm
08/21/2008	FAY	45	Tropical Storm
10/26/2012	SANDY	43	Tropical Storm

Source: National Climatic Data Center

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER. PLEASE NOTE THAT THESE OCCURRENCES ALSO SERVE AS HISTORICAL DATA FOR STORM SURGE OCCURRENCES.\*\*\*

**SECTION 5: HAZARD PROFILES**

**FIGURE 5.2: Historical Storm Tracks within 75 Miles of Volusia County**



Source: National Oceanic and Atmospheric Administration

## SECTION 5: HAZARD PROFILES

Some of the notable tropical cyclone events that occurred in Volusia County within the last two decades are described below (Information from National Climatic Data Center, National Oceanic and Atmospheric Administration, National Weather Service and National Hurricane Center):

### **Tropical Storm Gordon, 1994**

Tropical Storm Gordon made landfall in South Florida on November 13, 1994. Gordon caused a total of 8 deaths, 43 injuries, and \$400 million in damages (\$605,793,853; 2009 dollars). It affected a number of Florida Counties, including Dade and Brevard, but Volusia was hit especially hard. Volusia County experienced \$500,000 in both agricultural and property damage. Single-family, multi-family, and mobile home structures (a total of 1236 units) reported flood damage and losses were estimated at over \$26 million.

### **Hurricane Floyd, 1999**

On September 15, 1999, the center of Hurricane Floyd passed about 115 statute miles off the coast of Central Florida, causing substantial damage to the coastal counties of Brevard and Volusia. Winds gusts near 70 miles per hour were reported in both counties. In total, Floyd caused over \$61 million in property damage, but there were no reports of deaths or injuries (\$81,978,899; 2009 dollars). Over \$42 million in damages were reported in Volusia County, \$10 million of which was attributed directly to coastal erosion. In addition, over 300 homes were damaged from wind and falling trees.

### **Hurricane Irene, 1999**

Hurricane Irene reached hurricane status over the Florida Straits and the calm of the center moved over Key West on October 15, 1999. Most of the hurricane force winds were confined to the east of Irene's center over the lower to middle Keys. As Hurricane Irene moved across Southeast Florida, it brought tropical storm conditions with sustained winds between 39 and 73 miles per hour. Hurricane Irene caused considerable damage in South Florida due to flooding. In some residential areas, flooding lasted for a week, displacing several hundred people and isolating thousands more. Volusia County estimated that damages to approximately 185 properties; totaling more than \$16.8 million. The total losses (agricultural and property) were estimated near \$800 millions in of the state of Florida. An estimated 700,000 costumers lost electricity. There were eight indirect deaths reported in Florida.

### **Hurricane Charley, 2004**

Hurricane Charley produced wind gusts over 80 miles per hour as it traversed Volusia County on August 13, 2004. The storm caused over \$106 million in property damages in Volusia County. In addition, two fatalities were attributed to Hurricane Charley. Widespread power outages, roadway flooding, and fallen trees also occurred. A strong F1 tornado also touched down in South Daytona Beach contributing to the total damage from the event.

### **Hurricane Frances, 2004**

Hurricane Frances, a Category 2 storm, made landfall on September 4, 2004 in Martin County, Florida. As it moved north, Volusia County experienced hurricane force wind for several hours. Daytona Beach International Airport recorded wind gusts of 94 miles per hour. In addition to wind impacts, over 13 inches of rain fell in Volusia County which caused substantial flooding. Wind and flooding impacts resulted in damages of over \$390 million within Volusia County. Total damage estimates for all impacted

counties include over \$4.8 billion for property damage and \$93.2 million for crop damage. Despite widespread and severe damage, no deaths or injuries were reported.

### **Hurricane Jeanne, 2004**

Hurricane Jeanne made landfall on the east coast of Florida on September 26, 2004, with winds estimated at 120 mph. Wide spread rainfall of up to eight inches accompanied Hurricane Jeanne as it moved across eastern, central and northern Florida. A narrower band of 11 to 13 inches was observed in the vicinity of the eye wall track over Osceola, Broward and Indian River counties of east central Florida. A storm surge of approximately four feet above normal astronomical tide levels was measured at Trident Pier at Port Canaveral, Florida about an hour after landfall. Storm surge flooding of up to six feet above normal tides likely occurred along the Florida east coast from the vicinity of Melbourne southward to Ft. Pierce. Damages were estimated to be over \$59 million in Volusia County. The American Insurances Service Group reported that Frances caused a total of \$4.11 billion in Florida. There were three direct deaths reported in Florida, but the total death toll is estimated to be more than 3,000.

### **Tropical Storm Fay, 2008**

Moving over Key West, Tropical Storm Fay made its first Florida landfall on August 18, 2008. As the tropical storm drifted north in the Volusia County off shore waters, hours of heavy rain fell across southern Volusia County. Tropical Storm Fay's primary impact was inland flooding. Rainfall amounts ranged from three to five inches over Miami-Dade and Broward counties and seven to 10 inches over northern Collier, Hendry and Glades counties near the center path of Fay. Storm surges were relatively minimal for this tropical storm. In Florida, wind damage was confined to mostly downed trees and power lines, plus minor roof damage to homes. Homes, personal property and motor vehicles were the primary damage losses in the United States. Volusia County reported damages in excess of \$13.5 million. The total damage estimate, compiled by the Property Claim Services, is \$245 million, including \$195 million in Florida. Flood damage losses reported by the National Flood insurance Program were about \$36 million.

### **Tropical Storm Sandy, 2012**

A New Smyrna Beach mesonet site (XNSB) recorded sustained north winds of 43 mph and other spotter reports confirmed tropical storm winds along the immediate coast of Volusia County. Gusts of 50-55 mph occurred, especially during passing squalls. Hurricane Sandy moved slowly northwest, parallel to the Florida Coast, approximately 200-250 miles offshore.

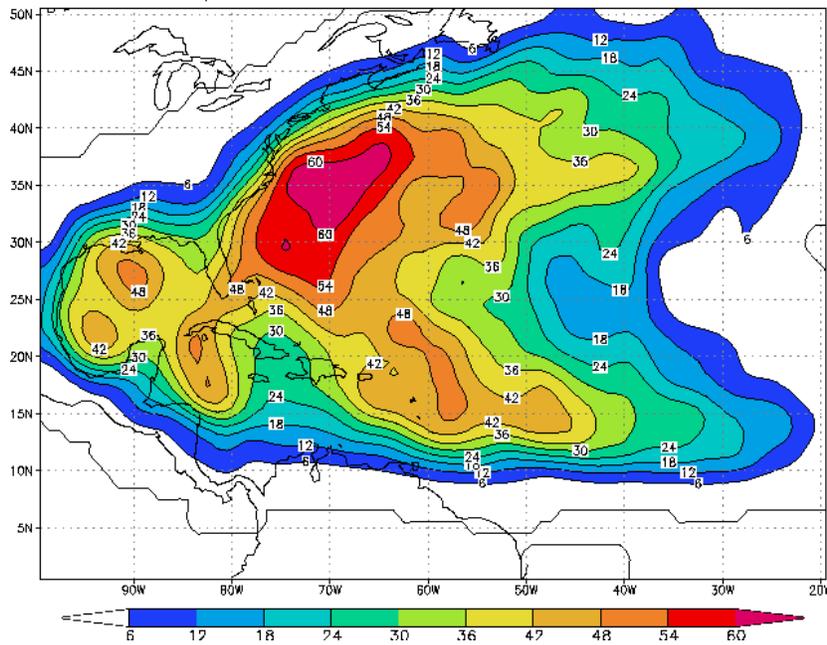
## **5.3.4 Probability of Future Occurrences**

The probability of future hurricane and tropical storm events for Volusia County is high. According to NOAA statistical data, Volusia County is located in an area with an annual probability of a named storm between 36 and 42 percent.

**Figure 5.3** shows for any particular location what the chance is that a tropical storm or hurricane will affect the area sometime during the Atlantic hurricane season. This illustration was created by the National Oceanic and Atmospheric Administration's Hurricane Research Division using data from 1944 to 1999 and counting hits when a storm or hurricane was within approximately 100 miles (165 km) of each location.

## SECTION 5: HAZARD PROFILES

**FIGURE 5.3: Empirical Probability of a Named Hurricane or Tropical Storm**



Source: National Oceanic and Atmospheric Administration

The probability of storm occurrences will vary significantly based on the return interval for different categories of magnitude. The probability of less intense storms (lower return periods) is higher than more intense storms (higher return periods). **Table 5.7** profiles the average potential peak gust wind speeds for each jurisdiction that can be expected in Volusia County during a hurricane event for various return periods according to FEMA’s HAZUS-MH®.

**TABLE 5.7: Average Peak Gust Wind Speeds (MPH) vs. Return Period**

JURISDICTION	10-YEAR	20-YEAR	50-YEAR	100-YEAR	200-YEAR	500-YEAR	1,000-YEAR
Daytona Beach	70.9	84.2	100.0	110.7	120.2	130.9	138.7
Daytona Beach Shores	71.8	85.4	101.4	112.3	121.7	132.4	140.3
DeBary	69.4	82.3	97.6	107.6	116.5	125.8	132.6
DeLand	69.0	81.8	97.0	107.2	116.0	125.7	132.0
Deltona	69.8	82.6	98.2	108.6	117.6	126.9	133.9
Edgewater	71.9	85.6	101.7	112.2	121.5	131.5	138.9
Holly Hill	70.7	84.2	99.7	110.2	119.9	130.8	138.7
Lake Helen	69.6	82.7	97.9	108.3	117.4	126.7	133.6
New Smyrna Beach	72.0	85.7	101.9	112.4	121.8	131.8	139.4

## SECTION 5: HAZARD PROFILES

**TABLE 5.7: Average Peak Gust Wind Speeds (MPH) vs. Return Period**

JURISDICTION	10-YEAR	20-YEAR	50-YEAR	100-YEAR	200-YEAR	500-YEAR	1,000-YEAR
Oak Hill	73.1	87.0	103.7	114.0	123.4	133.7	140.7
Orange City	69.2	82.1	97.3	107.4	116.3	125.7	132.4
Ormond Beach	70.5	84.0	99.5	110.2	119.8	130.6	138.4
Pierson	67.5	80.2	95.2	105.0	113.4	123.5	130.2
Ponce Inlet	71.8	85.5	101.6	112.3	121.7	132.0	140.0
Port Orange	71.2	84.7	100.5	111.4	120.7	131.0	138.9
South Daytona	71.2	84.7	100.6	111.4	120.7	131.3	139.2
Unincorporated	70.3	83.6	99.1	109.6	118.8	128.9	136.2

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from wind that future mitigation and adaptation strategies related to this hazard should be considered.

## 5.4 LIGHTNING

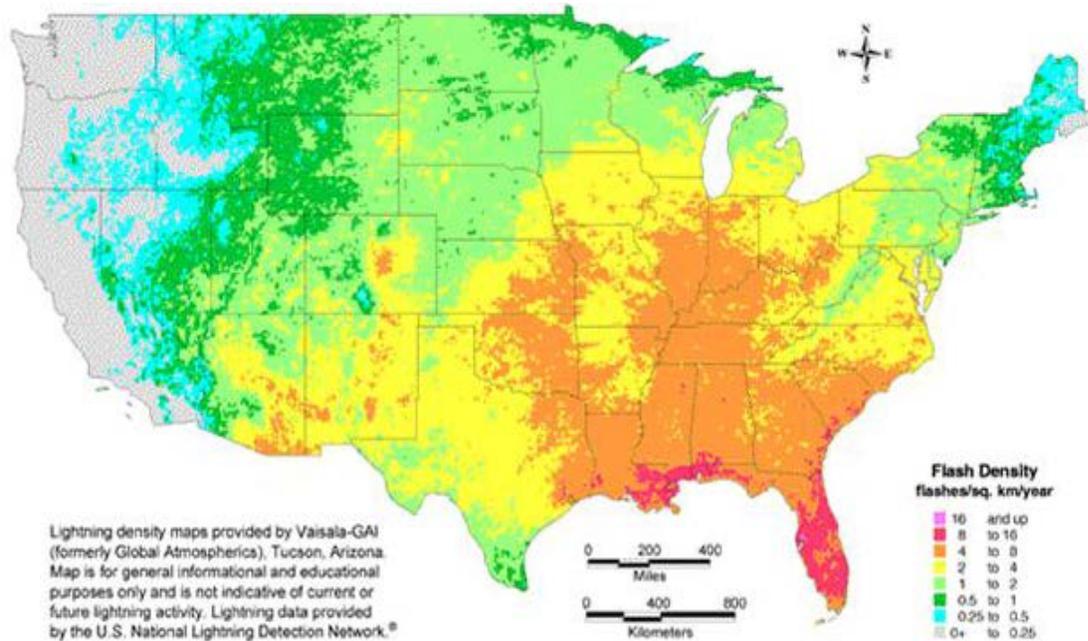
### 5.4.1 Background

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall.

According to FEMA, an average of 300 people is injured and 80 people are killed in the United States each year by lightning. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities, and infrastructure. Lightning is also responsible for igniting wildfires that can result in widespread damages to property before firefighters have the ability to contain and suppress the resultant fire<sup>5</sup>.

Volusia County is located in a region of the country that is particularly susceptible to lightning. **Figure 5.4** shows a lightning flash density map for the years 1996-2000 based upon data provided by Vaisala’s U.S. National Lightning Detection Network (NLDN<sup>®</sup>).

**FIGURE 5.5: Lightning Flash Density in the United States**



Source: Vaisala U.S. National Lightning Detection Network

<sup>5</sup>Wildfires are discussed in Section 5.14.

### 5.4.2 Location and Spatial Extent

Lightning occurs randomly and is, therefore, impossible to predict where it will strike. It is assumed that all of Volusia County is uniformly exposed to lightning which strikes in very small, specific geographic areas. Impacts from lightning have included deaths and injuries, damage to electrical systems, and fires that have destroyed residential and commercial property.

### 5.4.3 Historical Occurrences

According to the National Climatic Data Center, there have been a total of 23 recorded lightning events in Volusia County since 1996 that resulted in \$1,367,000 in damages, as listed in **Table 5.8**. However, these are only the lightning events that have been reported to NCDC. According to the emergency managers from various Volusia County jurisdictions thousands of lightning strikes occur each day during the summer afternoon thunderstorms. For example, in 1997 the Port Orange Police Department was struck by lightning twice in a two week period, each time knocking out the 911 consoles. In addition, during September 2007, there was a lightning event that occurred in Port Orange causing damages totaling \$310,000 to a property which had an appraisal value of \$350,000 and another which occurred in August 2009, in DeBary causing damages of \$500,000 to a church which had burned to the ground. Volusia has the second greatest number of lightning strikes in Florida, behind the Tampa Bay area. The corridor between I-75 and I-95 in the North Central Florida area experiences a high number of lightning strikes. **Table 5.8** is merely a sample of the lightning strikes that have occurred in the county.

**TABLE 5.8: Historical Lightning Occurrences**

LOCATION	DATE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Holly Hill	7/23/1994	0/1	\$0	A 17-year-old male riding a bike was hospitalized with burns to his chest after lightning struck the boy.
New Smyrna Beach	9/18/1994	1/1	\$0	A fast moving thunderstorm, which had produced rain for only a few minutes, produced the flash which struck the victims directly. One death and one injury resulted.
New Smyrna Beach	6/24/1995	0/1	\$0	A lifeguard on top of a high observation tower was struck and injured by lightning.
Ormond Beach	6/28/1995	0/1	\$0	A woman was injured by lightning while talking on a telephone in her home.
Daytona Beach	9/23/1995	1/1	\$0	Two men were struck by a lone lightning bolt. Both men were hospitalized in critical condition. One of the two died three days later.
DeBary	6/15/1996	0/0	\$285,935	Fires started by lightning destroyed two condominiums.
New Smyrna Beach	6/19/1996	0/0	\$100,077	Fire started by lightning severely damaged a house.

## SECTION 5: HAZARD PROFILES

**TABLE 5.8: Historical Lightning Occurrences**

LOCATION	DATE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Edgewater	8/20/1997	0/1	\$0	Lightning knocked a plumber unconscious while he was under a mobile home.
New Smyrna Beach	8/3/1999	0/0	\$4,032	A Volusia County Sheriff's Office horse was killed by lightning while standing under a tree.
Daytona Beach	7/4/2002	0/0	\$24,597	Lightning started a fire that damaged an apartment building in Daytona Beach.
Daytona Beach	7/4/2002	0/8	\$0	Eight spectators were struck and injured by lightning at Daytona Beach International Speedway. Two of the victims were hospitalized. Six were treated and released at the scene.
Port Orange	8/3/2002	1/0	\$0	A 62 year-old man was killed by lightning outside his home.
Edgewater	8/20/2002	0/0	\$18,448	Lightning started a fire that damaged a carpet store in Edgewater.
Oak Hill	7/21/2003	0/0	\$35,822	Fire started by lightning destroyed a mobile home.
Deltona	8/25/2003	0/0	\$298,513	Fire from a lightning strike destroyed a church in Deltona.
Port Orange	9/14/2003	0/0	\$298,513	Lightning struck a warehouse in Port Orange.
Daytona Beach	6/3/2004	0/2	\$0	Two spectators suffered minor injuries from a lightning strike at Daytona Beach International Speedway.
Pierson	7/7/2004	0/2	\$0	Two convenience store workers were briefly hospitalized after being injured by a lightning strike while working in the store kitchen.
Edgewater	5/24/2005	0/1	\$0	A 27 year-old man was seriously injured by lightning while in a wooded area near Edgewater.
DeLand	7/29/2005	0/0	\$0	Lightning strikes downed trees and power lines in DeLand.
DeBary	5/26/2006	0/1	\$0	A woman carrying a child outside was struck by lightning. The child was uninjured. The woman was transported to a hospital in critical condition.
Deltona	6/25/2007	0/0	\$26,523	Lightning heavily damaged a home in Deltona.
Ponce Park	9/12/2007	0/2	\$0	A small boat was struck by lightning in the Halifax River, resulting in minor injuries for two people.
DeBary	7/16/2008	0/0	\$4,120	Lightning ignited a barn fire near DeBary.
DeBary	7/16/2008	0/0	\$500,000	A lightning strike from an intense

## SECTION 5: HAZARD PROFILES

**TABLE 5.8: Historical Lightning Occurrences**

LOCATION	DATE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
				thunderstorm started a fire with burned a church to the ground.
Holly Hill	7/24/2009	0/1	\$0	Sea breeze boundaries collided over coastal Volusia County, resulting in the rapid development of a severe storm near Ormond Beach. This cell then back-built south-southwest along a boundary during the late afternoon, producing a complex of strong to severe cells farther inland. A waterspout developed within the initial severe cell offshore of Ormond Beach and moved onto the beach as a tornado, reaching the adjacent backyard of several homes just beyond the beach. This vortex meandered south along the beach and near-shore Atlantic waters for about ten minutes. Early in the evening, another tornado (EF-0) developed inland over Port Orange and damaged 150 mobile homes before lifting.
Daytona Beach	8/05/2009	0/1	\$0	Strong thunderstorms produced frequent cloud to ground lightning strikes across Volusia County. Two individuals were injured by lightning strikes in separate incidents about 30 minutes apart within Daytona Beach.
South Peninsula	8/05/2009	0/1	\$0	Strong thunderstorms produced frequent cloud to ground lightning strikes across Volusia County. Two individuals were injured by lightning strikes in separate incidents about 30 minutes apart within Daytona Beach.
DeBary	8/20/2009	0/0	\$4,000	Sea breeze thunderstorms produced lightning across central Florida. Lightning ignited a barn fire near DeBary.

Source: National Climatic Data Center

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

### 5.4.4 Probability of Future Occurrences

The probability of occurrence for future lightning events in Volusia County is high. According to NOAA, Volusia County is located in an area of the country that experiences 8-16 lightning flashes per square kilometer per year (approximately 20,224 to 40,448 flashes countywide per year). Given this regular frequency of occurrence, it can be expected that future lightning events will continue to threaten life and property throughout Volusia County. The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hurricanes that future mitigation and adaptation strategies related to this hazard should be considered.

## **5.5 SEVERE WINTER STORM**

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### **5.5.1 Background**

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. It may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Some winter storms might be large enough to affect several states, while others might affect only localized areas. Occasionally, heavy snow might also cause significant property damages, such as roof collapses on older buildings. All winter storm events have the potential to present dangerous conditions to Volusia County. Larger snowfalls pose a greater risk, reducing visibility due to blowing snow and making driving conditions treacherous. A heavy snow event is defined by the National Weather Service as an accumulation of 4 or more inches in 12 hours or less. A blizzard is the most severe form of winter storm. It combines low temperatures, heavy snow, and winds of 35 miles per hour or more, which reduces visibility to a quarter mile or less for at least three hours. Winter storms are often accompanied by sleet, freezing rain, or an ice storm.

Sleet is defined as partially frozen raindrops or refrozen snowflakes that form into small ice-pellets before reaching the ground. They typically bounce when they hit the ground and do not stick to the surface. However, it does accumulate like snow, posing similar problems and has the potential to accumulate into a layer of ice on surfaces. Freezing rain, conversely, usually sticks to the ground, creating a sheet of ice on the roadways and other surfaces. All of the winter storm elements – snow, low temperatures, sleet, ice, etc- have the potential to cause significant hazard to a community. Even small accumulations can down power lines and trees limbs and create hazardous driving conditions. Severe winter storms affect the entire county uniformly, as these are typically not localized events in Florida.

### **5.5.2 Location and Spatial Extent**

Nearly the entire continental United States is susceptible to winter storms, but the degree of exposure typically depends on the normal expected severity of local winter weather. Volusia County, being in the southern portion of the nation, rarely experiences winter weather events, and thus has a much lower risk than more northern areas of the country. Typically, there have not been many winter storms that have caused damage in Volusia County. However, there were two severe winter storms that killed many of the orange groves in the 80's. Future impacts throughout Volusia County could include damage to crops, nurseries and tree farms (e.g., Pierson is the fern capital of the world), and other vegetation; sleet could increase the number of vehicular accidents); and the increased use of alternate heating sources in homes could cause potential structural fires. Also, agriculture may be disproportionately affected.

A severe winter storm occurs when the surface air temperature is expected to be 32°F or below over a widespread area for at least 3 or more consecutive days (this is the minimum extent of a severe winter storm). Use of the term is usually restricted to aversive situations or occasions when wind or other conditions prevent frost. "Killing" may be used during the growing season when the temperature is expected to be low enough for a sufficient duration to kill all but the hardiest herbaceous crops. Extreme cold can immobilize an entire region. Even areas, such as Volusia County, that normally

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experience mild winters can be hit with a major extreme cold winter event. Winter storms can result in ice, localized flooding, closed highways, and blocked roads, downed power lines and hypothermia.

There is a low probability that Volusia County will experience 72 consecutive hours of temperatures below 32°F on an annual basis. However, outlier storms (such as the *Great Blizzard of 1899*) have been observed within Volusia County and are often the result of arctic activity that affects the entire North American continent. These events are of low probability on an annual basis but can occur.

Volusia County is more likely to experience freezing temperatures for much shorter durations of time. More specifically, temperatures tend to dip below the freezing threshold during night time from the months of November to February.

However freezing temperatures are not likely to persist for more than 24 hours at a time. In most circumstances, temperatures will only dip below freezing for a small number of hours during the night time. A number of these events were reported in Volusia County in the 2014 and 2015 time frame, one of the most recent and severe being the 'polar vortex' super storm on January 6<sup>th</sup> and 7<sup>th</sup>, 2014. Although temperatures dipped to freezing levels during this event, highs in the 50's were reported in Volusia and throughout Central Florida during the day time.

Temperatures within Volusia County, Florida were recorded as low as 6 degrees Fahrenheit in December 1962, according to the National Oceanographic and Atmospheric Administration. Temperatures dropped to 6 degrees for five consecutive days, although the temperature did not sustain at this level continuously. These temperatures can be experienced in the future in Volusia County, Florida.

### 5.5.3 Historical Occurrences

Despite the rare chance of winter storm occurrence, one snow event was reported in 2008 according to NCDC. On January 3, 2008, cold breezes off the Atlantic produced brief snow flurries along the coast of Volusia County. On January 9, 2010 sleet was reported in Volusia County. According to an Emergency Operations Management Volusia County manager, there were also two severe winter freezes in the mid to late 80's. These events killed many orange groves in Volusia County and around the state. There were no reports of death, injuries, or property damage as a result of the winter weather. Also, in 1899, a rare blizzard struck the state of Florida, inundating much of the state in up to one-foot on snow. There are no official historic occurrences of this hazard on the National Climatic Data Center web database.

### 5.5.4 Probability of Future Occurrences

There is a low probability of future winter storm occurrences in Volusia County; however outlier storms such as the 1899 Blizzard can occur with an extremely low probability. Winter storm events will remain an infrequent occurrence in Volusia County. Given the average winter temperature of 61.5 degrees Fahrenheit, it is highly unlikely that a winter event beyond light snow will occur.

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hail and that future mitigation and adaptation strategies related to this hazard should be considered.

### 5.6 Thunderstorm

#### 5.6.1 Background

Thunderstorms are common throughout Florida and occur throughout the year. Although thunderstorms generally affect a small area, they are very dangerous given their ability to produce accompanying hazards including high winds, hail, and lightning which all may cause serious injury or death, in addition to property damage<sup>6</sup>.

According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as “severe.” A severe thunderstorm occurs when the storm produces one of three elements: 1) Hail of three-quarters of an inch; 2) Tornado; 3) Winds of at least 58 miles per hour.

Three conditions need to occur for a thunderstorm to form. First, it needs moisture to form clouds and rain. Second, it needs unstable air, such as warm air that can rise rapidly (this often referred to as the “engine” of the storm). Finally, thunderstorms need lift, which comes in the form of cold or warm fronts, sea breezes, mountains, or the sun’s heat. When these conditions occur, air masses of varying temperatures meet, and a thunderstorm is formed. These storm events can occur singularly, in lines, or in clusters. Further, they can move through an area very quickly or linger for several hours.

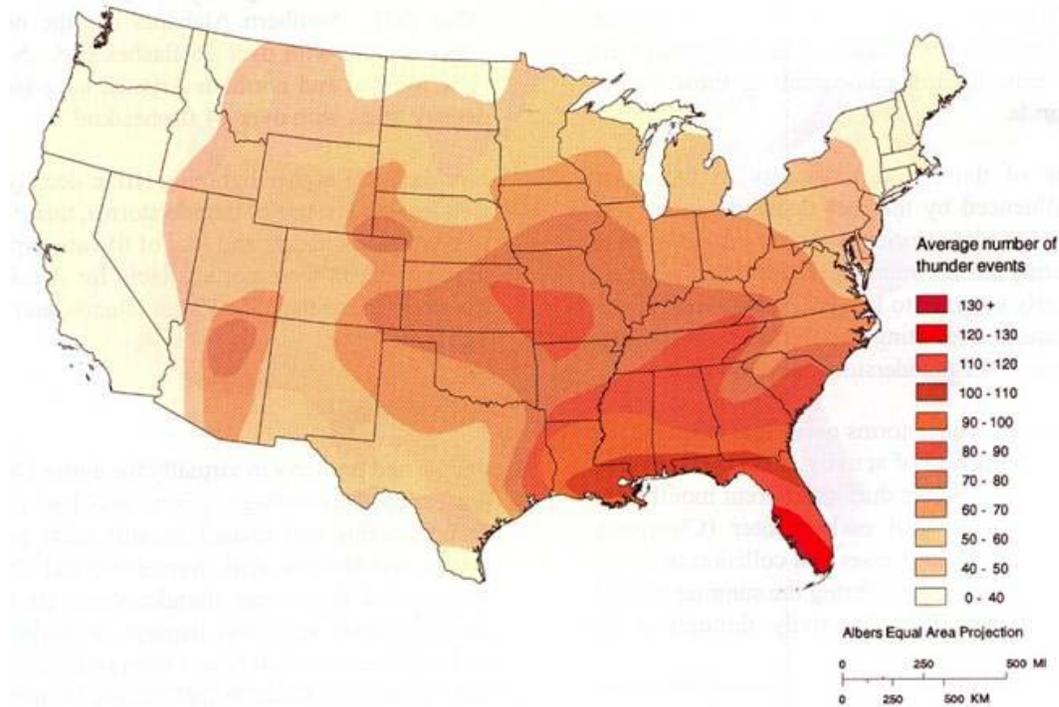
Severe weather has the ability to affect all jurisdictions within Volusia County and their duration can span from localized events (less than 10 minutes locally) to hours-long events (primarily in the case of hurricanes or large tropical systems). Please reference the table that depicts thunderstorm days per year for a scope on the annual average number of thunderstorm events per year. This table depicts the relatively high risk that Florida faces as compared to the rest of the United States. Lightning incidence within Central Florida is among the heaviest in the world; the only other comparable areas include tropical areas of Africa in terms of lightning strike density. Please reference the lightning map within this report.

The National Weather Service collected data for thunder events and lightning strike density for the 30-year period from 1948 to 1977. A series of maps were generated showing the annual average thunder event duration, the annual average number of thunder events and the mean annual density of lightning strikes. **Figure 5.5** illustrates thunderstorm hazard severity based on the annual average number of thunder events from 1948 to 1977. Volusia County falls into the range of an average of 110 – 120 thunderstorm events annually.

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<sup>6</sup> Lightning and Hail are discussed in detail as separate hazards in this section.

Figure 5.5: Average Annual Number of Thunder Events



Source: Federal Emergency Management Agency

### 5.6.2 Location and Spatial Extent

Severe thunderstorms and their related hazardous elements (including lightning, hail, and straight-line winds) are not confined to any geographical boundaries and typically are widespread events (**Figure 5.5**). Further, while thunderstorms can occur in all regions of the United States, they are most common in the central and southern states because atmospheric conditions in those regions are favorable for generating these powerful storms. Therefore, it is assumed that Volusia County would be uniformly exposed to these hazards and that the spatial extent of that impact would potentially be large.

### 5.6.3 Historical Occurrences

According to the National Climatic Data Center, Volusia County has experienced approximately 195 thunderstorm events since 1950. Further, 34 of these thunderstorm events resulted in property damage totaling over \$2.5 million. **Table 5.9** shows historic thunderstorm events, including thunderstorm winds and high winds, which resulted in property damage in Volusia County. (Other windstorms, such as tornadoes and hurricanes, are addressed separately in this section.) In addition to property damage, these severe thunderstorm events resulted in two injuries and over \$70,000 in crop damage.

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**TABLE 5.9: Historical Thunderstorm Occurrences Resulting in Property Damage**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 Dollars)	DESCRIPTION
Pierson	3/27/2000	Thunderstorm Winds	0/0	\$19,572	Severe thunderstorm winds blew down trees on a house near Pierson.
Deltona	7/26/2000	Thunderstorm Winds	0/1	\$15,657	Thunderstorm winds blew down power lines and trees in the Deltona Area. One woman was injured when a tree fell on her car as she was driving in Deltona.
Orange City	9/03/2000	Thunderstorm Winds	0/0	\$39,143	Thunderstorm winds blew down numerous trees and power lines in Orange City. Falling trees damaged six residences.
Emporia	9/04/2000	Thunderstorm Winds	0/0	\$13,048	Thunderstorm winds blew down a large shed cover at a fern nursery.
Daytona Beach	3/13/2001	Thunderstorm Winds	0/1	\$38,003	Strong microburst winds hit the barrier island in Daytona Beach destroying a large tent and a beach tollbooth. One person was injured.
Daytona Beach	6/16/2001	Thunderstorm Winds	0/0	\$19,002	Thunderstorm winds blew a 50 foot section off the roof of a restaurant in Daytona Beach.
New Smyrna Beach	8/21/2001	Thunderstorm Winds	0/0	\$20,268	Thunderstorm winds swept across the New Smyrna Beach Airport overturning a small plane and damaging six others.
DeBary	8/05/2002	Thunderstorm Winds	0/0	\$12,299	Thunderstorm winds blew down trees on a mobile home in DeBary.
Deltona	3/07/2003	Thunderstorm Winds	0/0	\$1,194	Thunderstorm winds blew down numerous trees and power lines in Deltona.
Deltona	3/19/2003	Thunderstorm Winds	0/0	\$119,405	Strong thunderstorm winds swept across the Deltona area blowing down dozens of trees that damaged houses and vehicles.
Holly Hill	7/12/2003	Thunderstorm Winds	0/0	\$21,493	Thunderstorm winds destroyed a large gas station roof awning in Holly Hill.
Osteen	4/08/2004	Thunderstorm Winds	0/0	\$255,040	Thunderstorm winds produced widespread damage to a mobile home community southwest of Osteen. Many of the homes had damage to attached sun rooms, awnings and sheds. About 15 trees were blown down. The event was accompanied by a large amount of small hail.
Port Orange	6/16/2005	Thunderstorm Winds	0/0	\$45,020	Thunderstorm winds overturned a mobile home and damaged two others east of Port Orange.
Daytona Beach	6/17/2005	Thunderstorm Winds	0/0	\$11,255	Thunderstorm winds blew down a large tree which damaged a truck.
Deltona	5/28/2006	Thunderstorm	0/0	\$27,318	Thunderstorm winds downed power lines and power transformers in Deltona. downed

## SECTION 5: HAZARD PROFILES

**TABLE 5.9: Historical Thunderstorm Occurrences Resulting in Property Damage**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 Dollars)	DESCRIPTION
		Winds			trees
Daytona Beach Airport	7/15/2007	Thunderstorm Winds	0/0	\$21,218	Thunderstorm winds peeled back part of a roof on an apartment complex on the barrier island. A band of thunderstorms moved from central Florida to the coast and Lake Okeechobee producing hail, strong winds and funnel clouds.
DeLand	4/03/2008	Thunderstorm Winds	0/0	\$1,030	Thunderstorm winds blew down large tree branches that took out power lines in DeLand. Afternoon pulse thunderstorms produced wind damage in DeLand.
Edgewater	4/05/2008	Thunderstorm Winds	0/0	\$8,240	Thunderstorm winds blew down trees and power lines in Edgewater. A pre-frontal squall line produced widespread wind damage and hail across central Florida.
New Smyrna Beach	4/05/2008	Thunderstorm Winds	0/0	\$12,360	Thunderstorm winds blew down trees and power lines in New Smyrna Beach. A pre-frontal squall line produced widespread wind damage and hail across central Florida.
Ormond Beach	6/19/2008	Thunderstorm Winds	0/0	\$2,060	Ormond Beach dispatch reported trees down on power lines at Nova Road. The daily east coast sea breeze pushed inland and produced thunderstorms over coastal sections of Central Florida.
Fatio	6/21/2008	Thunderstorm Winds	0/0	\$5,150	Law enforcement reported three trees down across County Road 42. The daily east coast sea breeze pushed inland and produced thunderstorms over coastal and interior sections of Central Florida.
Beresford	6/21/2008	Thunderstorm Winds	0/0	\$1,030	Law enforcement reported a large tree down across State Road 44. The daily east coast sea breeze pushed inland and produced thunderstorms over coastal and interior sections of Central Florida.
DeBary	10/9/2008	Thunderstorm Winds	0/0	\$0	A north moving warm front produced widespread thunderstorms across central Florida.
Holly Hill	10/9/2008	Thunderstorm Winds	0/0	\$0	A north moving warm front produced widespread thunderstorms across central Florida.
Osteen	10/9/2008	Thunderstorm Winds	0/0	\$0	A north moving warm front produced widespread thunderstorms across central Florida.
Daytona Beach	10/9/2008	Thunderstorm Winds	0/0	\$0	A north moving warm front produced widespread thunderstorms across central Florida.
Orange City	4/14/2009	Thunderstorm Winds	0/0	\$0	A squall line well ahead of a cold front produced numerous thunderstorms with damaging straight-line winds, large hail and a brief, weak tornado. Several Line Echo Wave Pattern (LEWP) features were apparent on radar with rotating comma

## SECTION 5: HAZARD PROFILES

**TABLE 5.9: Historical Thunderstorm Occurrences Resulting in Property Damage**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 Dollars)	DESCRIPTION
					head signatures.
Harbor Point	6/18/2009	Thunderstorm Winds	0/0	\$0	Numerous strong storms impacted central Florida ahead of a stalled frontal boundary far to the north. Local sea breeze interactions combined with a large scale outflow boundary propagating to the region prompted the storm development. Many storms produced small hail and wind gusts 45-55 mph, with two storms strengthening to severe levels and resulting in damaging wind gusts.
DeLand	6/13/2009	Thunderstorm Winds	0/0	\$0	Numerous strong storms developed over east central Florida, with a few strengthening to severe levels and producing wind damage and large hail.
DeLand	3/31/2009	Thunderstorm Winds	0/0	\$0	A northward-lifting warm front combined with active sea breeze boundaries within an unstable atmosphere produced several severe thunderstorms with nickel to quarter sized hail and localized severe winds.
Lake Harney	8/3/2009	Thunderstorm Winds	0/0	\$0	Thunderstorms along the east coast sea breeze boundary progressed inland and intensified to produce minor wind damage and a funnel cloud.
DeLand	1/21/2010	Thunderstorm Winds	0/0	\$0	Numerous strong thunderstorms moved across the county, well ahead of a cold front during the late afternoon and evening. One of the storms became severe and produced localized wind damage. A funnel cloud was also observed by the Daytona Beach Airport (KDAB) weather observer.
Ormond Beach	6/3/2010	Thunderstorm Winds	0/0	\$0	Numerous strong thunderstorms lifted northeast across east-central Florida from mid-afternoon through early evening. Two of the storms became severe and produced damaging winds which downed several trees and large limbs within Orange and Volusia Counties.
DeLand	8/22/2010	Thunderstorm Winds	0/0	\$0	Saturated grounds from previous rains, along with recent heavy rain and 30 mph wind gusts from a thunderstorm passing 30 minutes earlier, caused a large pine tree to topple as a vehicle was traveling beneath, resulting in a fatality.
Ormond Beach	4/5/2011	Thunderstorm Winds	0/0	\$0	A pre-frontal squall line crossed central Florida during the morning and early afternoon. A few of the storms became strong to severe and produced high winds and a funnel cloud, primarily across Volusia and Brevard Counties.
Volusia County	6/17/2011	Thunderstorm Winds	0/0	\$0	Numerous strong to severe storms formed along the east coast sea breeze across the central Florida interior and Volusia County,

## SECTION 5: HAZARD PROFILES

**TABLE 5.9: Historical Thunderstorm Occurrences Resulting in Property Damage**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 Dollars)	DESCRIPTION
					producing dime to quarter sized hail and winds of 50 to 60 mph.
Volusia County	3/30/2011	Thunderstorm Winds	0/0	\$0	A rare Florida derecho affected the region during the late afternoon and early evening, well ahead of a strong cold front. The rapidly moving squall line, contained multiple bow echoes as it moved across the central portion of Florida at 60 mph.
DeBary	3/30/2011	Thunderstorm Winds	0/0	\$0	A rare Florida derecho affected the region during the late afternoon and early evening, well ahead of a strong cold front. The rapidly moving squall line, contained multiple bow echoes as it moved across the central portion of Florida at 60 mph.
DeBary	3/30/2011	Thunderstorm Winds	0/0	\$0	A rare Florida derecho affected the region during the late afternoon and early evening, well ahead of a strong cold front. The rapidly moving squall line, contained multiple bow echoes as it moved across the central portion of Florida at 60 mph.
Deltona	3/30/2011	Thunderstorm Winds	0/0	\$0	A rare Florida derecho affected the region during the late afternoon and early evening, well ahead of a strong cold front. The rapidly moving squall line, contained multiple bow echoes as it moved across the central portion of Florida at 60 mph.
DeLand	8/13/2011	Thunderstorm Winds	0/0	\$5,000	An isolated severe thunderstorm developed along a boundary collision in central Volusia County and produced wind damage.
Glencoe	5/17/2012	Thunderstorm Winds	0/0	\$0	The east coast sea breeze formed in the early afternoon and propagated inland, eventually colliding with the west coast sea breeze over the central peninsula. Storms moved to the east and northeast and produced large hail over Brevard and Volusia Counties.
Oak Hill	8/8/2012	Thunderstorm Winds	0/0	\$0	A line of storms developed along the west coast sea breeze and intensified as it interacted with the east coast sea breeze. One of the storms in this line became severe near Haulover Canal.
Volusia County	6/30/2013	Thunderstorm Winds	0/0	\$0	Deep southwesterly flow led to the development of several strong to severe thunderstorms, which moved from the Orlando area to the coast of Volusia and Brevard Counties. Peak winds gusts reached 66 mph in Orlando. Thunderstorm winds also peeled back part of a roof from a home in Port Orange.
Volusia County	9/11/2013	Thunderstorm Winds	0/0	\$10,000	An isolated heavy shower moved onshore from the Atlantic late at night and produced wind damage to the upper story of an apartment complex.

## SECTION 5: HAZARD PROFILES

**TABLE 5.9: Historical Thunderstorm Occurrences Resulting in Property Damage**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 Dollars)	DESCRIPTION
Deltona	12/15/2013	Thunderstorm Winds	0/0	\$1,000	A broken line of showers and thunderstorms moved rapidly southeast across Volusia County. Two cells along the line caused minor wind damage to trees, but no structural damage. Part of a tree fell onto powerlines and a vehicle in Deltona, and tree limbs temporarily blocked a road in Osteen.
Coronado Beach	02/12/2014	Thunderstorm Winds	0/0	\$0	A squall line developed out ahead of a cold front over the eastern Gulf of Mexico. Thunderstorms within the squall line produced damaging winds and large hail (although hail was not reported in Volusia County)
Daytona Beach	04/01/2014	Thunderstorm Winds	0/0	\$0	A broken line of showers moved northeast across Volusia and Brevard Counties. A severe thunderstorm developed near the northern edge of the line and caused localized wind damage near Daytona Beach International Airport and Embry-Riddle Aeronautical University Campus.

Source: National Climatic Data Center

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

### 5.6.4 Probability of Future Occurrences

Thunderstorms are frequent in Volusia County. During the summer, Volusia County experiences a thunderstorm nearly every afternoon. They will undoubtedly continue to occur, thereby threatening the lives, safety, and property in Volusia County. Therefore, the probability of future occurrences is high.

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from thunderstorms and that future mitigation and adaptation strategies related to this hazard should be considered.

### 5.7 TORNADO

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#### 5.7.1 Background

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 to more than 300 miles per hour and are a few yards wide. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction, carving a path over a mile wide and several miles long and turning normally harmless objects into deadly missiles.

Over 800 tornadoes are reported nationwide annually, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2007). They are more likely to occur during the months of March through May and can occur at any time of day, but are likely to form in the late afternoon and early evening. Further, the tornadoes associated with tropical cyclones are most frequent in September and October when the incidence of tropical storm systems is greatest. The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings (particularly mobile homes). The magnitude of tornadic activity is reported using the Enhanced Fujita Scale (**Table 5.10**). However, tornado magnitudes prior to 2005 were classified using the traditional version of the Fujita Scale (**Table 5.11**).

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from tornadoes and that future mitigation and adaptation strategies related to this hazard should be considered.

## SECTION 5: HAZARD PROFILES

**TABLE 5.10: Enhanced Fujita Scale for Tornadoes (Effective 2005 and after)**

F-SCALE NUMBER	INTENSITY	WIND SPEED (MPH)	TYPE OF DAMAGE DONE
<b>F0</b>	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
<b>F1</b>	MODERATE	86–110	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
<b>F2</b>	SIGNIFICANT	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
<b>F3</b>	SEVERE	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
<b>F4</b>	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
<b>F5</b>	INCREDIBLE	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

Source: National Weather Service

## SECTION 5: HAZARD PROFILES

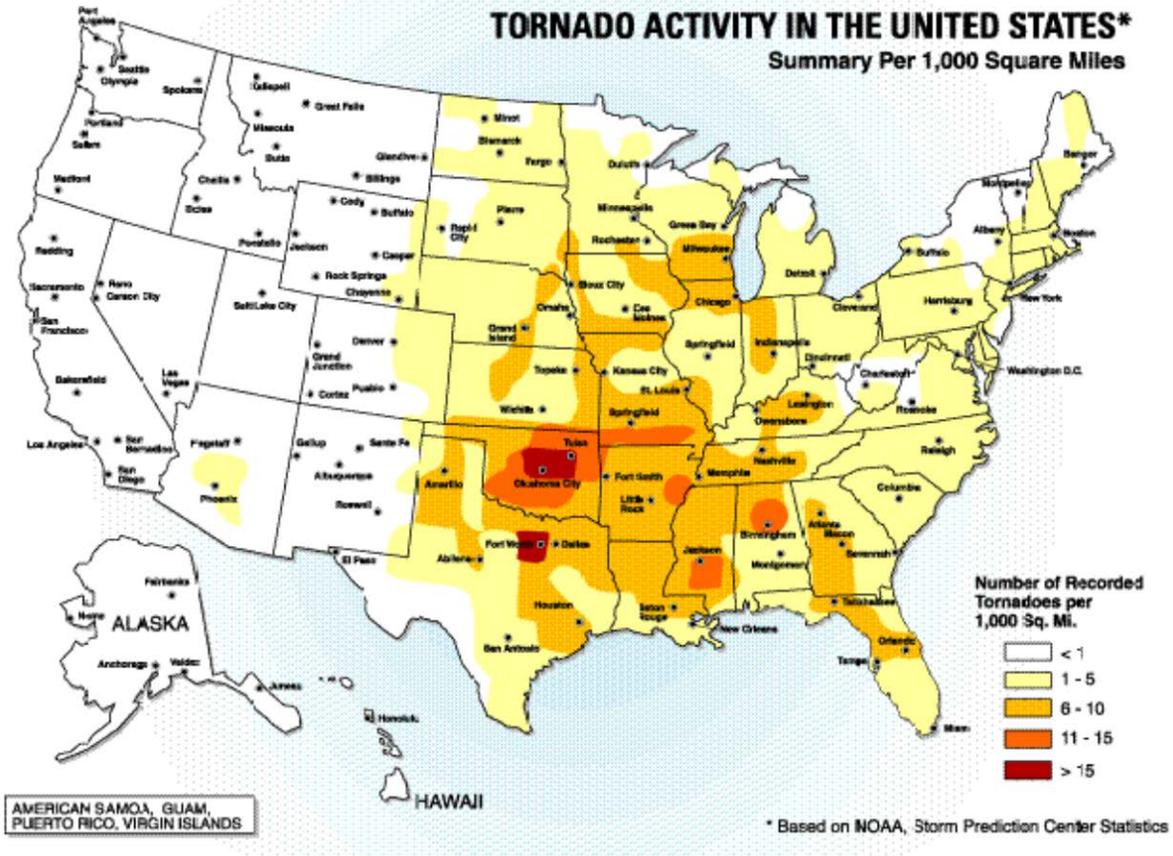
**TABLE 5.11: The Fujita Scale (Effective Prior to 2005)**

F-SCALE NUMBER	INTENSITY	WIND SPEED (MPH)	TYPE OF DAMAGE DONE
F0	GALE	40–72	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
F1	MODERATE	73–112	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	SIGNIFICANT	113–157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	SEVERE	158–207	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
F4	DEVASTATING	208–260	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	INCREDIBLE	261–318	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	INCONCEIVABLE	319–379	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Source: National Weather Service

According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas and Florida. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of “tornado alley”), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). **Figure 5.6** shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

FIGURE 5.6: Tornado Activity in the United States



Source: Federal Emergency Management Agency

### 5.7.2 Location and Spatial Extent

Based on historic data, tornadoes occur throughout the state of Florida at a rate of 1-10 confirmed touchdowns per 1,000 square miles. Florida tornadoes typically impact a relatively small area; however, events are completely random and it is not possible to predict specific areas that are more susceptible to a tornado strike over time. Therefore, it is assumed that all of Volusia County is uniformly exposed to this hazard. April, May, and June are considered the peak months for Florida tornadoes.

### 5.7.3 Historical Occurrences

According to the National Climatic Data Center, there have been a total of 88 recorded tornado events in Volusia County since 1953. Each of these events occurred in the Volusia County study area as listed in **Table 5.12**. Two deaths, 151 injuries, and nearly \$205 million in property resulted from these events. The magnitude of these tornadoes ranged from F0 to F3 in intensity, with approximate locations for each shown in **Figure 5.7**.

## SECTION 5: HAZARD PROFILES

**TABLE 5.12: Historical Tornado Impacts**

LOCATION	DATE	MAGNITUDE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	DESCRIPTION
Volusia County	5/8/1950	F1	0/0	\$27,851	Not Available
Volusia County	7/12/1959	unknown	0/0	\$0	Not Available
Volusia County	10/12/1959	unknown	0/0	\$0	Not Available
Volusia County	7/14/1960	unknown	0/0	\$0	Not Available
Volusia County	7/19/1960	unknown	0/0	\$0	Not Available
Volusia County	8/29/1961	F2	0/0	\$188,115	Not Available
Volusia County	7/7/1963	F1	0/0	\$21,995	Not Available
Volusia County	8/9/1963	unknown	0/0	\$0	Not Available
Volusia County	1/12/1964	F0	0/0	\$21,772	Not Available
Volusia County	8/28/1964	unknown	0/0	\$0	Not Available
Volusia County	8/30/1968	F2	0/0	\$160,999	Not Available
Volusia County	7/22/1969	unknown	0/0	\$18,329	Not Available
Volusia County	10/2/1969	unknown	0/0	\$0	Not Available
Volusia County	7/17/1970	F0	0/0	\$0	Not Available
Volusia County	8/27/1971	F2	0/1	\$16,624	Not Available
Volusia County	5/20/1972	F2	0/0	\$134,368	Not Available
Volusia County	6/19/1972	F1	0/0	\$134,368	Not Available
Volusia County	8/22/1972	F2	0/0	\$134,368	Not Available
Volusia County	4/11/1975	F0	0/0	\$12,504	Not Available
Volusia County	4/14/1975	F0	0/0	\$0	Not Available
Volusia County	5/15/1975	F0	0/0	\$104,204	Not Available
Volusia County	8/9/1975	F0	0/0	\$12,504	Not Available
Volusia County	5/22/1976	F0	0/0	\$987,344	Not Available
Volusia County	5/23/1976	F0	0/0	\$0	Not Available
Volusia County	7/3/1976	F0	0/0	\$11,848	Not Available
Volusia County	4/18/1978	F1	0/0	\$861,249	Not Available
Volusia County	6/9/1978	F0	0/0	\$10,335	Not Available
Volusia County	7/27/1978	F0	0/0	\$0	Not Available
Volusia County	8/13/1978	F1	0/1	\$86,125	Not Available

## SECTION 5: HAZARD PROFILES

**TABLE 5.12: Historical Tornado Impacts**

LOCATION	DATE	MAGNITUDE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	DESCRIPTION
Volusia County	9/4/1978	F0	0/0	\$10,335	Not Available
Volusia County	9/22/1978	F0	0/0	\$0	Not Available
Volusia County	9/27/1978	F0	0/0	\$0	Not Available
Volusia County	1/24/1979	unknown	0/0	\$77,363	Not Available
Volusia County	5/5/1979	F1	0/0	\$773,633	Not Available
Volusia County	5/8/1979	F1	0/6	\$7,736,328	Not Available
Volusia County	9/3/1979	F2	0/0	\$1,624,629	Not Available
Volusia County	9/29/1979	F0	0/0	\$0	Not Available
Volusia County	3/7/1982	F1	0/0	\$25,000	Not Available
Volusia County	6/17/1982	F1	0/0	\$253,000	Not Available
Volusia County	4/15/1983	F1	0/0	\$6,765	Not Available
Volusia County	4/23/1983	F1	0/0	\$56,375	Not Available
Volusia County	11/20/1983	F2	0/0	\$5,637,514	Not Available
Volusia County	4/14/1984	F0	0/0	\$53,991	Not Available
Volusia County	6/27/1984	F1	0/0	\$5,399,069	Not Available
Volusia County	2/8/1986	F0	0/0	\$51,206	Not Available
Volusia County	3/14/1986	F1	0/1	\$51,206	Not Available
Volusia County	1/21/1988	F1	0/0	\$474,030	Not Available
Volusia County	5/11/1988	F0	0/0	\$0	Not Available
Volusia County	11/9/1990	F0	0/3	\$5155	Not Available
Edgewater	10/7/1996	F2	0/0	\$3,431,216	In Edgewater, a 400 yard wide F2 tornado touched down near I-95. The smaller F0 tornadoes in Pierson, Deltona, and Daytona Beach Shores caused minor in the affected areas, including blowing out 12 windows in Daytona Beach Shores.
Pierson	10/7/1996	F0	0/0	\$0	
Deltona	10/7/1996	F0	0/0	\$0	
Daytona Beach Shores	10/7/1996	F0	0/0	\$7,148	
New Smyrna Beach	4/23/1997	F0	0/0	\$0	The F0 tornado downed trees and damaged dozens of homes, including 20 in New Smyrna Beach alone.
Pierson	4/23/1997	F0	0/0	\$83,856	
Port Orange	4/23/1997	F0	0/0	\$167,713	
New Smyrna Beach	4/23/1997	F0	0/0	\$349,402	

## SECTION 5: HAZARD PROFILES

**TABLE 5.12: Historical Tornado Impacts**

LOCATION	DATE	MAGNITUDE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	DESCRIPTION
Oak Hill	7/5/1997	F0	0/0	\$41,928	The brief touchdown damaged 2 houses and 8 mobile homes.
New Smyrna Beach	11/2/1997	F3	0/32	\$19,566,485	A rapidly intensifying tornado initially touched down in New Smyrna Beach about 1 mile west of U.S. Highway 1 between Enterprise and Wayne Avenues. The tornado moved east northeast at about 50 mph damaging several homes and downing trees and power lines. It lifted just west of Highway 1 after passing Chisholm Elementary School. The tornado then struck New Smyrna Beach High School producing Fujita Scale F1 damage. As the tornado intensified to a strong F3 category, it passed through the Venetian Villas subdivision and the Diamond Head Condominiums. A number of large well built homes were destroyed. Many of the units in the 10 story Diamond Head Condominiums received major damage as high winds blew out exterior glass walls and blew furniture into the adjoining Indian River Lagoon. The tornado then crossed the Intracoastal Waterway and passed over the barrier island between Robinson Road and East Street where a number of large well built homes were almost completely destroyed. The tornado then moved over the Atlantic Ocean. In all 32 people were injured, six requiring hospitalization. Thirty one homes were destroyed and 290 were damaged. Damage estimates were near 14 million dollars.
Emporia	2/16/1998	F0	0/0	\$111,808	Sixteen mobile homes were damaged and one was destroyed.
Daytona Beach	2/22/1998	F2	1/3	\$5,504,681	This tornado cell caused extensive damage and two deaths throughout Volusia County. In Daytona beach one person was killed and three others were injured while in a mobile home. In
Osteen	2/23/1998	F3	1/0	\$1,376,170	
Oak Hill	2/23/1998	F2	0/0	\$688,085	

## SECTION 5: HAZARD PROFILES

**TABLE 5.12: Historical Tornado Impacts**

LOCATION	DATE	MAGNITUDE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	DESCRIPTION
					Osteen, a man staying in a recreational vehicle was killed.
Port Orange	7/28/1998	F0	0/0	\$137,617	Thirty-three mobile homes were damaged with this F0 tornado.
New Smyrna Beach	9/17/2000	F0	0/0	\$13,048	This tornado caused minor damage including power outages and downed signs and trees.
Daytona Beach	3/13/2001	F1	0/5	\$6,333,850	This F1 damaged over 100 houses and dozens of vehicles, many due to fallen trees. Five people were injured.
New Smyrna Beach	9/14/2001	F0	0/0	\$70,939	This tornado was a result of a rainstorm associated with Tropical Storm Gabriel. Twelve mobile homes were damaged and three were destroyed.
Daytona Beach	8/8/2004	F0	0/0	\$0	A waterspout came ashore, blowing branches from trees.
South Daytona	8/13/2004	F1	0/0	\$0	This tornado cell was associated with Hurricane Charley. It caused minor damage to homes, commercial buildings, and trees.
Daytona Beach Shores	8/13/2004	F0	0/1	\$0	
DeLand	12/25/2006	F2	0/5	\$2,731,818	An F2 tornado touched down just west of North Stone Street in DeLand and moved northeast crossing Highway 17. It moved across the Fernwood mobile home community and continued northeast over Meadowlea Estates mobile home community. It lifted just north of Carter Road. Fifty two residences were destroyed and 162 were damaged. Five people were seriously injured.
Daytona Beach (Airport)	12/25/2006	F2	0/6	\$54,636,350	The same system that caused five injuries and damaged 162 homes in DeLand touched down at Daytona Beach International, destroying 40 Embry Riddle University aircraft and the two story administration building. East of Embry Riddle Aeronautical University, 48 apartments units were destroyed and 200 were damaged.
Beresford	2/2/2007	F3	0/42	\$55,166,800	The tornado that killed 13 people

## SECTION 5: HAZARD PROFILES

**TABLE 5.12: Historical Tornado Impacts**

LOCATION	DATE	MAGNITUDE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	DESCRIPTION
New Smyrna Beach (Airport)	2/2/2007	F1	0/0	\$6,365,400	in Lake County moved east across the St. Johns River, crossed into Volusia county at Lake Beresford and moved across DeLand as an F3 tornado. It was still moving east northeast at 50 MPH as it damaged 277 and destroyed 106 residences in the DeLand area. There were no fatalities in Volusia County but 42 people were injured.
Lake George	7/7/2007	F0	0/0	\$31,827	Tornado-force winds caused damage to a restaurant and apartment complex.
Port Orange	7/24/2009	F0	0/1		This tornado was caused by a seabreeze merger, when winds from both coasts meet and cause the rotation. Although it was classified as the mildest of twisters, it caused damage to 163 homes in Port Orange. Of these, seven were totally destroyed, eight had major damage, and twenty-six had moderate damage. The same system produced a waterspout that came ashore in Ormond Beach, destroying a catamaran.
Ormond Beach	7/24/2009	F0	0/0		
Edgewater	8/7/2010	F0	0/0	\$58,000	A waterspout formed within a thunderstorm over the intracoastal river, then moved onshore the adjacent barrier island in New Smyrna Beach and produced minor damage as it crossed to the Atlantic coast.
Edgewater	8/11/2010	F0	0/0	\$5,000	Scattered thunderstorms trained northward near the Florida east-central coast, within a strong southerly flow due in part to the presence of Tropical Depression Five remnants near the central Gulf coast. Around mid-day, a waterspout developed over the intracoastal river and moved onshore the mainland in Edgewater, producing minor damage. Several hours later, another storm developed rotation and produced a brief touchdown in a wooded area, farther inland over southern Volusia County.
Glencoe	8/11/2010	F0	0/0	\$0	Scattered thunderstorms trained northward near the Florida east-central coast, within a strong southerly

## SECTION 5: HAZARD PROFILES

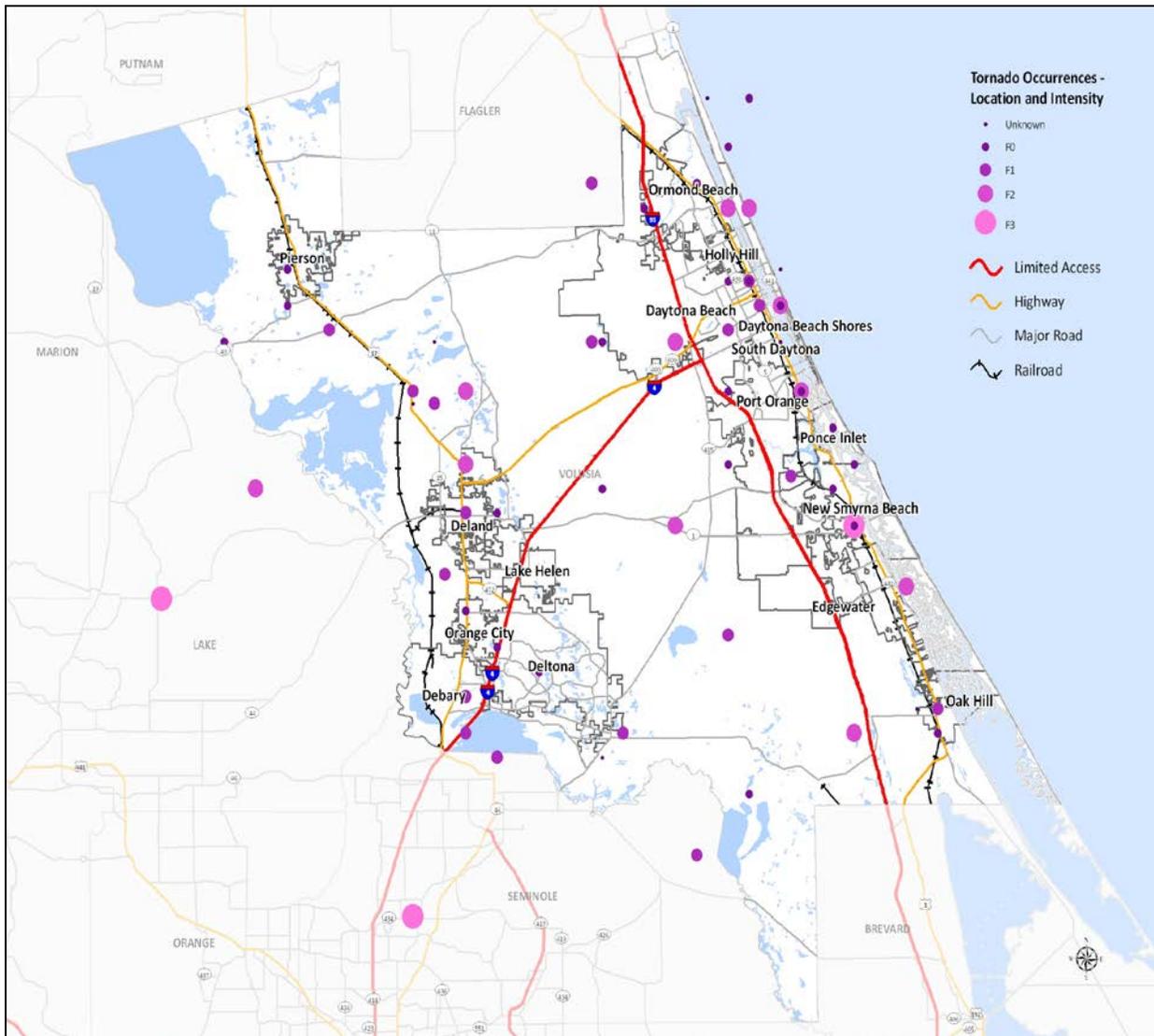
**TABLE 5.12: Historical Tornado Impacts**

LOCATION	DATE	MAGNITUDE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	DESCRIPTION
					flow due in part to the presence of Tropical Depression Five remnants near the central Gulf coast. Around mid-day, a waterspout developed over the intracoastal river and moved onshore the mainland in Edgewater, producing minor damage. Several hours later, another storm developed rotation and produced a brief touchdown in a wooded area, farther inland over southern Volusia County.
Volusia County	12/10/2012	F0	0/0	\$1,000	Very moist southwest winds developed across east-central Florida well in advance of a cold front and associated upper level disturbance. Strong daytime heating, combined with moderate low-level wind shear, resulted in numerous strong storms, two of which produced tornadoes. The first tornado began as a waterspout over Lake Apopka, then crossed the northeast shore of the lake and remained on the ground for a short distance. Although the waterspout/tornado affected a rural area, several citizens witnessed the event. The second tornado impacted a mobile home park and adjacent wooded area in Edgewater, then became a waterspout as it crossed the intracoastal river, before moving across the barrier island as a tornado. Significant damage occurred at the mobile home park, with only minor damage on the barrier island. Several funnel clouds were also observed.
Volusia County	12/10/2012	F1	0/2	\$1.7 Million	
Edgewater	7/26/2014	F0	N/A	N/A	A tornado struck down in Edgewater at Park Avenue and Wildwood Drive near Massey Air Park at 4:30pm, causing damage to several hangars and planes. Winds reached 65 to 85 mph.

Source: National Climatic Data Center

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

FIGURE 5.7: Locations of Historical Tornado Events in Volusia County



Source: National Oceanic and Atmospheric Administration

### 5.7.4 Probability of Future Occurrences

The probability of a future tornado affecting Volusia County is high. According to historical records, Volusia County experiences, on average, more than one (1.2) confirmed tornado events annually. While the majority of these events are small in terms of size, intensity and duration, a greater number of stronger storms (i.e., F2 and F3 tornadoes) have been reported in the past decade. Further, even a minor tornado can cause substantial damage. In conclusion, tornadoes pose a significant threat to lives and property in Volusia County.

## HYDROLOGIC HAZARDS

### 5.8 COASTAL EROSION

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#### 5.8.1 Background

Coastal erosion is a hydrologic hazard defined as the wearing away of land and loss of beach, shoreline, or dune material and is measured as the rate of change in the position or horizontal (landward) displacement of a shoreline over a period of time. Short-term erosion typically results from episodic natural events such as hurricanes and storm surge, windstorms and flooding hazards, but may be exacerbated by human activities such as boat wakes, removal of dune and vegetative buffers, shoreline hardening and dredging. Long-term erosion is a function of multi-year impacts such as wave action, sea level rise, sediment loss, subsidence and climate change. Climatic trends can change a beach from naturally accreting to eroding due to increased episodic erosion events caused by waves from an above-average number of storms and high tides, or the long-term effects of fluctuations in sea level.

Natural recovery from erosion can take years, often decades. If a beach or dune system does not recover quickly enough naturally, coastal and upland property may be exposed to further damage in subsequent coastal erosion and flooding events. Human actions to supplement natural coastal recovery, such as beach nourishment, dune stabilization and shoreline protection structures (e.g., sea walls, groins, jetties, etc.) can mitigate the hazard of coastal erosion, but may also exacerbate it under some circumstances.

Death and injury are not associated with coastal erosion; however, it can cause the destruction of buildings and infrastructure and represents a major threat to the local economies of coastal communities that rely on the financial benefits of recreational beaches.

#### 5.8.2 Location and Spatial Extent

All coastal areas in Volusia County are susceptible to coastal erosion. Using Florida Department of Environment field data beginning in 1972, it is clear that Volusia County shorelines are moving due to erosion, accretion, and beach nourishment projects<sup>7</sup>. Further, nearly half of the 47 miles of shoreline in Volusia County are classified as critically eroded.

The beach ridge in Volusia County ranges from 300 – 3,000 feet in width. A majority of the county, ranging approximately from Ormond Beach to Bethune Beach, has fine-grained quartz sand. Sand in areas north and south of this area consist of a shell-quartz mixture and have steeper slopes than the central county. The southernmost mile of shoreline in Volusia County makes up part of the Canaveral National Seashore Park, while the northernmost area is part of the North Peninsula State Recreation Area.

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<sup>7</sup> Foster, Emmet and Jenny Cheng. Shoreline Beach Change Estimates, Volusia County, 2000. Office of Beaches and Coastal Systems, Florida Department of Environmental Protection; Beaches and Shores Research Center, Florida State University.

### 5.8.3 Historical Occurrences

According to the National Climatic Data Center, there have been five events with reported coastal erosion impacts in Volusia County since 1998, as shown in **Table 5.13**. Because the erosion events were part of other hazard events (e.g., storm surge and hurricanes), the monetary damage for the erosion alone is unknown.

**TABLE 5.13: Historical Coastal Erosion Impacts**

LOCATION	DATE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Volusia County	9/14/1999	0/0	\$56,444,488	Hurricane Floyd caused significant beach erosion in Volusia County. Of the property damage estimates, over \$13 million was attributed to beach erosion.
St. Lucie and Volusia Counties	10/14/1999	0/0	\$68,539,735	Hurricane Irene caused beach loss of four to ten feet in the affected areas with damage in the millions.
Brevard and Volusia Counties	9/04/2001	0/0	\$6,333,850	Storm tide from a tropical storm reached two feet above normal, causing significant beach erosion.
St. Lucie and Volusia Counties	9/25/2004	0/0	\$440,408,221	Severe beach erosion was reported from Hurricane Jeanne, a category 3 storm.
Volusia County	8/21/2008	0/0	Unknown	New Smyrna Beach experienced a loss of 50 feet of new sand due to wind gust of over 45 MPH from Tropical Storm Fay. Even Orange and Seminole counties experienced riverine erosion along the St. Johns River.

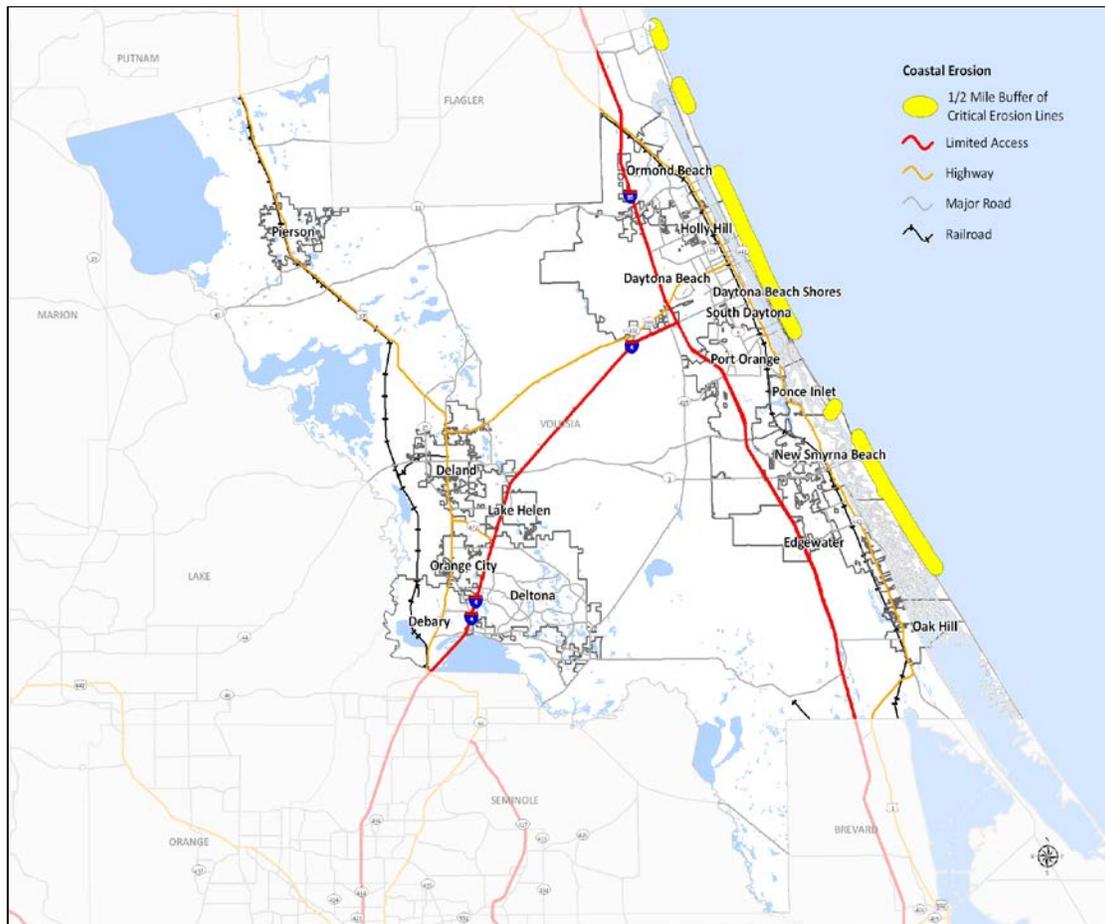
Source: National Climatic Data Center (Most Recent Data Compiled on Online Database; October 2014)

The severity of coastal erosion is typically measured through a quantitative assessment of annual shoreline change for a given beach cross-section of profile (feet or meters per year) over a long period of time. Erosion rates vary as a function of shoreline type and are influenced primarily by episodic events, but can be used in land use and hazard management to define areas of critical concern.

According to the Florida Bureau of Beaches and Coastal Systems, a division within the Florida Department of Environmental Protection, there are 4 critically eroded beaches in Volusia County, totaling over 22 miles of beachfront<sup>8</sup>. These areas are highlighted in **Figure 5.8**. A critical beach erosion area is defined as an area where natural or human processes has caused or contributed to the erosion or recession of the beach or dune system (Florida Bureau of Beaches and Coastal Systems). The largest contiguous area of critically eroded beach is an 11 mile stretch between Ormond Beach and Daytona Beach Shores. This area is threatening recreation and development opportunities in the area. There are also 8 miles of critically eroded beachfront between New Smyrna Beach and Bethune Beach. In addition, there are two segments of critically eroded beach in northern Volusia that threaten State Road A1A.

<sup>8</sup> Office of Beaches and Coastal Systems, Florida Department of Environmental Protection, 2009.

FIGURE 5.8: Critical Erosion Areas in Volusia County



Source: Florida Department of Environmental Protection, Division of Beaches and Coastal Systems

#### 5.8.4 Probability of Future Occurrences

The probability of the continuing occurrence of coastal erosion in the coastal areas of Volusia County is high. Florida's Bureau of Beaches and Coastal Systems estimates an average of a one foot loss annually for Volusia County in stable or accretionary areas. The area between Ormond Beach and Daytona Beach Shores are eroding at a rate between zero and 0.5 feet annually, according to a 2000 study. Northern areas of the county, including the North Peninsula State Recreation Area, lose between 0.5 and 1.5 feet annually. Areas south of the Ormond Beach to Daytona Beach Shores stretch have lower expected erosion rates due to extensive armoring (e.g., beach walls and revetments). However, natural erosion is occurring southward from South of Ponce de Leon Inlet. Loss rates are as high as 1.5 feet per year and decrease heading in southerly direction. The damaging impacts of coastal erosion are lessened through continuous (and costly) beach nourishment and structural shoreline protection measures. However, it is likely that the impacts of coastal erosion will increase in severity due to future episodic storm events. The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hail and that future mitigation and adaptation strategies related to this hazard should be considered.

## 5.9 DROUGHT

### 5.9.1 Background

Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. High temperatures, high winds, and low humidity can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts. Droughts are typically classified into one of four types<sup>9</sup>:

- ▶ **Meteorological:** The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- ▶ **Hydrologic:** The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- ▶ **Agricultural:** Soil moisture deficiencies relative to water demands of plant life, usually crops.
- ▶ **Socioeconomic:** The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Droughts are slow-onset hazards, but over time can have very damaging affects to crops, municipal water supplies, recreational uses, and wildlife. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

### 5.9.2 Location and Spatial Extent

The Palmer Drought Severity Index (PDSI) is based on observed drought conditions and range from -0.5 (incipient dry spell) to -4.0 (extreme drought). Evident in **Figure 5.9**, the Palmer Drought Severity Index Summary Map for the United States, droughts affect most areas of the United States, but are less severe in the Eastern United States.

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index (Figure 5.9), Florida has the relatively low risk for drought hazard. However, local areas may experience much more severe and/or frequent drought events than what is represented on the Palmer Drought Severity Index map. Further, it is assumed that Volusia County would be uniformly exposed to drought, making the spatial extent potentially widespread. During long periods of drought, a disruption in the water cycle can have potentially damaging effects, including substantial crop loss in the northwestern portion of the county. Periods of drought can exacerbate the ignition of wildfires that can damage the natural and built environment, as has occurred before in Volusia County.

As of 2015, the Keech Byran Drought Index (KBDI) for Volusia is in the 300-399 range, a relatively low (moderately wet) score on a scale that measures up to from 0 (wet) to 800 (arid conditions). The score rose to 582 in April 2013.

One of the most severe cases of drought in Florida occurred from October 2010 until June of 2012 in which a major portion of the state displayed D3 (Drought Extreme) conditions. During this extensive

<sup>9</sup> Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

## SECTION 5: HAZARD PROFILES

period, the two month period of April and May of 2012, showed the highest level of drought concern with portions of the state under a D-4 Drought Exceptional condition (The National Drought Mitigation Center, 2014). Thus, Volusia County can experience the full array of drought conditions, from D0 to D4. NOAA describes D4 events as having “extensive and widespread crop and pasture losses, fire risk, shortages of water in reservoirs, stream and wells that yield water emergencies... D4 can loosely be likened to a “once-in-a-generation” type of drought noted by the second percentile, or a 1 in 50 year drought.

### Drought Monitor Intensities

Scale	Severity
D0	Abnormally Dry
D1	Drought- Moderate
D2	Drought- Severe
D3	Drought- Extreme
D4	Drought- Exceptional

Source: NOAA

### Drought Duration

#### U.S. Drought Monitor Classification Scheme

**S** = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

**L** = Long-Term, typically more than 6 months (e.g. hydrology, ecology)

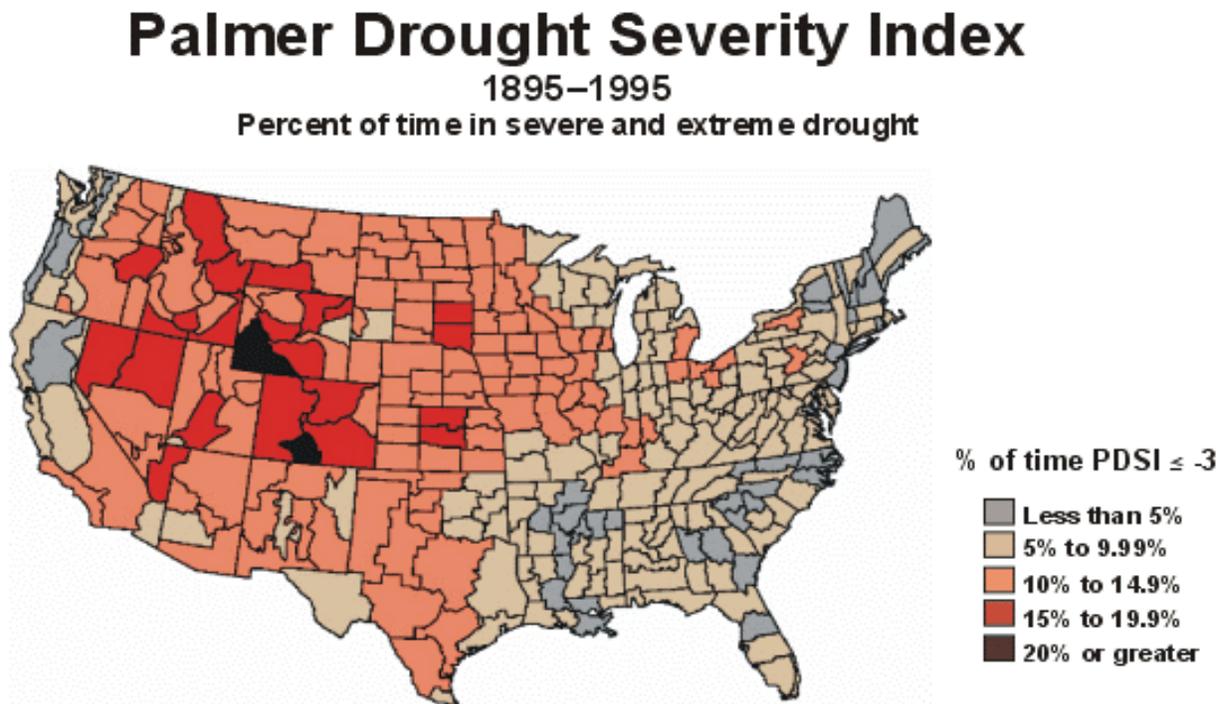
*\*Both of these have been observed in Florida. In the late 1990's, a long term drought effected Central Florida, while the most recent drought (2010-2012) was also a long term drought.*

Drought Impacts: A drought is noted as a period of unusual dry weather that persists long enough to cause serious problems such as crop damage and/or water supply shortages. There are four basic approaches to measuring drought (Wilhite, 1985):

- Meteorological- defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period.
- Agricultural-drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels.
- Hydrological- associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater).
- Socioeconomic-associated with the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought.

In partnership with County and municipal staff and the St. Johns River Water Management District, a contingency plan is in place to restrict water use across the county in an effort assist with water conservation efforts during periods of drought. Some direct impacts related to drought include reduced crop production, increased fire hazard, reduced water levels at major lakes and rivers, damage to fish habitat, and income loss for the agriculture industry. These impacts have been recorded as a result of historic events including the extreme drought conditions of 2010-2012.

Figure 5.9: Palmer Drought Severity Index Summary Map for the United States



Source: National Drought Mitigation Center

### 5.9.3 Historical Occurrences

Secondary research was conducted to determine the historical drought occurrences in Volusia County. It was determined that general drought conditions were present throughout Florida in 1981, 1985, 1998-1999, and 2001. Volusia County is part of the St. Johns River Water Management District, which monitors well levels throughout its jurisdiction. The Keetch Bryam Drought Index is a numerical scale (0-800) that measures the amount of moisture in the soil. A zero indicates wet, full saturation conditions while an 800 represents extreme drought conditions. It is often used to assess the danger of wildfires but is also an indication of drought. Therefore, it is reported where information is available. The following highlight some of the events from the aforementioned years.

**1981:** Drought conditions were reported throughout Southern Florida. Three firefighters narrowly escaped injury while fighting a drought-related wildfire. Officials from St. Johns River Water Management District ordered a mandatory 15 percent reduction in water use for public water supply, industrial, commercial and self-supplied users<sup>10</sup>.

**1985:** A short, six-month drought was reported in Volusia County. In addition to sparking wildfires, it led to a water warning calling for voluntary water usage restrictions<sup>11</sup>. On June 20, 1985, the water warning

<sup>10</sup> "Winds, Dry Weather Worsen Central Florida Fires. Ocala Star-Banner. Associated Press. July 1, 1981.

<sup>11</sup> "Fires Still Rage in Volusia County." Evening Independent. Associated Press.

## SECTION 5: HAZARD PROFILES

was expanded throughout St. Johns Water Management District. Volusia County had been placed under the warning months earlier<sup>12</sup>. On August 14, the warning was lifted as counties were able to meet usage demands due to recent rainfall.

**1998:** Volusia County reported a Drought Index reading of 700. Wildfires were abundant throughout the County. This year was reported as having the driest conditions in 50 years. The drought did not officially end until 2002<sup>13</sup>.

**Jan 1999:** Volusia County reported a Drought Index of 500.

**May 2000:** The May Drought Index was reported at 432 – 570. By early 2001 the Drought Index average for Volusia County was 601.

### 5.9.4 Probability of Future Occurrences

It is assumed that all of Volusia County is uniformly exposed to a drought event. As with any location, some areas of the county may be affected more severely than others during a drought. Given the frequency of previous events, warm temperatures, and average rainfall, the probability of future drought events is high.

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from winter storms/freezes and that future mitigation and adaptation strategies related to this hazard should be considered.

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<sup>12</sup> “St. John’s Water District Expands Warning Area.” Gainesville Sun. Associated Press. June 20, 1985.

<sup>13</sup> NAVARRO, MIREYA. “Thousands Flee Florida Homes as Fires Surge.” July 2, 1998. Section A, page 1, New York Times.

### 5.10 FLOOD

#### 5.10.1 Background

Flooding is the most frequent and costly natural hazard in the United States, a hazard that has caused more than 10,000 deaths since 1900. Nearly 90 percent of presidential disaster declarations result from natural events where flooding was a major component.

Floods generally result from excessive precipitation, and can be classified under two categories: general floods, precipitation over a given river basin for a long period of time along with storm-induced wave or tidal action; and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is typically determined by a combination of several major factors, including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface.

*A general flood is* usually a long-term event that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves and heavy rainfall produced by hurricanes, tropical storms and other large coastal storms<sup>14</sup>. Urban flooding occurs where manmade development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Most *flash flooding* is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. However, flash flooding events may also occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by a retention basin or other stormwater control facility. Although flash flooding occurs most often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces.



Maytown Road experienced extreme flooding during the 2009 Volusia County rain storms

<sup>14</sup> While briefly mentioned here, coastal flooding is more thoroughly addressed under the “storm surge” hazard.

The periodic flooding of lands adjacent to rivers, streams and shorelines (land known as floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 100-year floodplain represents a 1 percent annual chance of flood. The frequency of flood events, such as the 1 percent annual chance flood, is determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 1 percent annual chance flood refers to area in the 100-year floodplain and has a 1 percent chance of occurring in any given year. Similarly, the 0.2 percent flood covers the 500-year floodplain and has a 0.2 percent chance of occurring in any given year. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

### 5.10.2 Location and Spatial Extent

Many areas of Volusia County are susceptible to riverine and urban (stormwater) flooding, and its coastal areas are also very susceptible to tidal and coastal flooding due to coastal storm events including storm surge.<sup>15</sup> **Figure 5.10** illustrates the location and extent of currently mapped Special Flood Hazard Areas for Volusia County based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.<sup>16</sup> This includes Zones A/AE (100-year floodplain), Zone VE (100-year coastal flood zones, associated with wave action) and Zone X (500-year floodplain). It is important to note that while FEMA digital flood data is recognized as best available data for planning purposes, it does not always reflect the most accurate and up-to-date flood risk. Impacts have included flooding of hundreds of homes, schools, and roads, including the blockage of I-95 in Ormond Beach during a 2004 flash flood. Flooding and flood-related losses often do occur outside of delineated special flood hazard areas. The most recent FIRM maps were released in 2014 and are being utilized in this plan.

Water can rise to exceptional levels during hurricane, storm surge, flash flood and thunderstorm conditions. Water levels have historically risen up to 6 feet within southwestern Volusia County following one of these events, with increased water heights for coastal communities due to Florida's semidiurnal tides. Roadway flooding has been seen rising between 1 and 5 feet.

There are a number of areas that are disproportionately affected to flooding, including areas adjacent to the St. Johns River (Maytown to Enterprise).

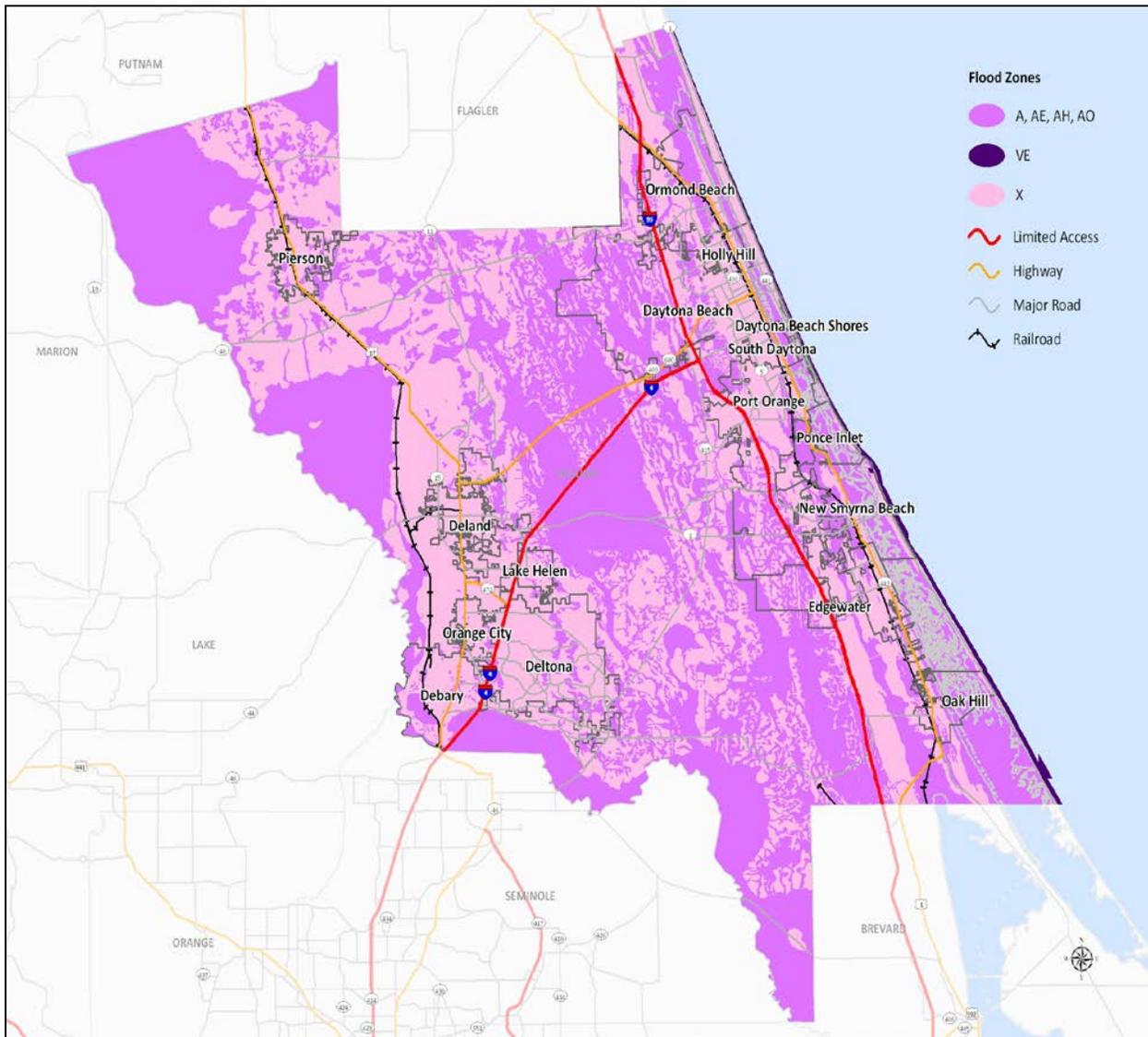
### 5.10.3 Probability of Future Occurrences

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from flooding and that future mitigation and adaptation strategies related to this hazard should be considered.

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<sup>15</sup> Storm surge is addressed separately within this section.

FIGURE 5.10: Special Flood Hazard Areas in Volusia County



Source: Federal Emergency Management Agency --- NOTE: More detailed maps can be found in the next section of the report.

### 5.10.3 Historical Occurrences

According to the National Climatic Data Center, there have been 14 reported flood events in Volusia County since 1993. According to the data as shown in **Table 5.14**, there was over \$21 million in property damage (not including recorded agricultural losses) during this period (2009 dollars).

## SECTION 5: HAZARD PROFILES

**TABLE 5.14: Historical Flood Impacts in Volusia County**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Peninsular	9/15/1994	Flooding	0/0	\$757,242	Two synoptic-scale systems, one tropical and one non-tropical brought heavy rain to most of peninsular Florida the last half of September. Other sections of Florida, particularly northeast and east central, experienced urban flooding which closed roads and flooded schools and homes in Duval County and flooded subdivisions in Flagler, Volusia, St. Johns and Brevard counties.
Countywide	10/11/1994	Flood	0/0	\$757,242	Heavy rains across much of northeast Florida caused widespread flooding of roadways and vehicles and minor flooding of schools, businesses and residences. Strong onshore winds caused significant beach erosion and minor coastal flooding along portions of the northeast coast.
Oak Hill	9/19/1999	Flash Flood	0/0	\$13,439	Heavy rain of 2 to 4 inches produced flooding in Oak Hill. Two homes had minor flooding.
Edgewater	9/14/2001	Flash Flood	0/0	\$316,693	Rainfall from Tropical Storm Gabrielle flooded about 25 homes and apartments in Edgewater and New Smyrna Beach. About 5 homes were flooded along the Tomoka River in Daytona Beach. Roadway and small stream flooding was reported over much of the county.
Ponce Park	11/14/2001	Flash Flood	0/0	\$633,385	Showers and thunderstorms dumped over 5 inches of rain in coastal sections of Volusia County. Thirty-five homes in the Ponce Inlet, Daytona Beach and Ormond by the Sea areas received some water damage.
Deltona	8/19/2002	Urban Flood	0/0	\$0	Thunderstorms produced street flooding in Deltona.
Ormond Beach	8/8/2004	Flash Flood	0/0	\$0	Heavy rain in the morning hours brought 24 hour rain totals to near 7 inches. Widespread street flooding with water in two homes in Ormond Beach was reported. A lane of Interstate 95 was blocked by flood waters.
Countywide	9/5/2004	Flash Flood	0/0	\$0	From 10 to 12 inches of rain from the northern rain bands of Hurricane Frances produced widespread flooding of homes, businesses and roads across coastal communities as well as in Deltona, and DeLand.
Countywide	9/9/2004	Flood	0/0	\$5,564,516	Hurricane Frances produced 6 to 10 inches of heavy rain over much of the middle and upper St. Johns River Basin. Beginning on September 9th, water levels began to reach flood stage on the middle basin mainly around Geneva, and Sanford. Levels continued to rise well above flood stage and began to fall slightly until Hurricane Jeanne followed the same track across the state. Significant flooding followed with a record crest of 10.1 feet being reached at the Lake Harney Gage. Many homes were flooded near Stone Island.

## SECTION 5: HAZARD PROFILES

**TABLE 5.14: Historical Flood Impacts in Volusia County**

LOCATION	DATE	TYPE	DEATHS/ INJURIES	PROPERTY DAMAGE (2009 dollars)	DESCRIPTION
Countywide	8/21/2008	Flash Flood	0/0	13.4 Mil.	As Tropical Storm Fay drifted north in the Volusia County off shore waters, hours of torrential rain fell across southern Volusia county. Close to 200 homes were flooded. Damage was near \$13 million. Torrential rain from Tropical Storm Fay produced widespread flooding across Brevard and central and southern Volusia counties.
Deltona	5/19/2009	Flood	0/0	68.6 Mil.	Multiple rounds of heavy rainfall over five days led to several feet of standing water in many areas of eastern Volusia County. Rainfall totals reached 18 to 28 inches in several coastal areas.
Ormond Beach	5/22/2009	Flash Flood	0/0	N/A	High levels of pre-existing flood waters were exacerbated as two to four inches of additional rainfall occurred in less than three hours as heavy cells trained onshore. Standing water rose to three feet or higher in several locations. Flood waters entered additional homes. Flash flood damage estimates were included collectively in the five-day flood event from May 19-24.

Source: National Climatic Data Center

\*\*\*NOTE: ALL HISTORICAL OCCURRENCES IN THIS REPORT ARE THE MOST RECENT AS DOCUMENTED BY THE NATIONAL CLIMATIC DATA CENTER\*\*\*

According to the emergency management officials from the Volusia County jurisdictions, another significant flood event occurred during the Memorial Day Weekend in May 2009 that was not included in the NCDL database. This event caused high rains and four feet of storm surge. There was between approximately \$68 million in damages along the coastline from Ormond Beach to New Smyrna Beach. Approximately 1,000, infrastructure and various critical facilities were damaged. Daytona Beach, alone, had approximately 650 damaged homes.

### 5.10.4 Historical Summary of Insured Flood Losses

All jurisdictions in Volusia County participate in the National Flood Insurance Program (NFIP). According to FEMA flood insurance policy records as of April 2014, there have been 3,880 flood losses reported in Volusia County through the NFIP since 1970, totaling more than \$50 million in claims payments. **Table 5.15** provides flood insurance policy and claim summary information for each of the participating jurisdictions. The reported losses include both inland (freshwater) and coastal flooding events. It should be emphasized that these numbers include only those losses to structures that were insured through the NFIP policies, and for losses in which claims were sought and received. It is likely that many additional instances of flood losses in Volusia County were either uninsured, denied claims payment, or not reported.

## SECTION 5: HAZARD PROFILES

**TABLE 5.15: NFIP Policy and Claim Information**

JURISDICTION	NUMBER OF FLOOD INSURANCE POLICIES	NUMBER OF LOSSES REPORTED	TOTAL PAYMENTS
Daytona Beach	8,524	552	\$9,412,509.69
Daytona Beach Shores	5,166	66	\$265,812.70
DeBary	628	78	\$4,107,646.28
DeLand	169	13	\$327,686.00
Deltona	1,479	28	\$336,990.87
Edgewater	1,262	84	\$498,234.29
Holly Hill	1,078	159	\$2,093,155.67
Lake Helen	17	-	\$0.00
New Smyrna Beach	8,206	418	\$3,320,129.23
Oak Hill	116	3	\$35,573.36
Orange City	110	7	\$690,412.26
Ormond Beach	5,154	476	\$4,203,605.93
Pierson	2	-	\$0.00
Ponce Inlet	2,490	106	\$801,831.01
Port Orange	3,606	416	\$6,947,298.62
South Daytona	1,172	297	\$4,042,267.91
Volusia County	11,158	1,177	\$13,167,869.07
<b>TOTAL</b>	<b>50,337</b>	<b>3,880</b>	<b>\$50,251,022.89</b>

### 5.10.5 Repetitive Loss Properties

FEMA defines a repetitive loss property as any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP. Currently there are over 122,000 repetitive loss properties nationwide.

According to FEMA repetitive loss property records (as of April 2009), there are 203 “non-mitigated” repetitive loss properties located in Volusia County. These properties have accounted for a total of 441 losses and more than \$8 million in claims payments under the NFIP. Without mitigation, these properties will likely continue to experience flood losses. In 2012, the Biggert Waters Flood Insurance Reform Act eliminated the RFC program. **Table 5.16** provides summary information about repetitive loss properties in Volusia County.

## SECTION 5: HAZARD PROFILES

**TABLE 5.16: Repetitive Flood Loss Property Summary**

JURISDICTION	LOSSES REPORTED FROM RL PROPERTIES	NUMBER OF RL PROPERTIES		PROPERTY VALUES
		TOTAL	LOSSES BY LAND USE	
Daytona Beach	64	32	21 RESIDENTIAL, 4 COMMERCIAL, 7 INSTITUTIONAL	NEXT PAGE
Daytona Beach Shores	NA	NA	NONE	NEXT PAGE
DeBary	6	3	3 RESIDENTIAL	NEXT PAGE
DeLand	NA	NA	NONE	NEXT PAGE
Deltona	8	3	3 RESIDENTIAL	NEXT PAGE
Edgewater	6	2	2 RESIDENTIAL	NEXT PAGE
Holly Hill	NA	NA	NONE	NEXT PAGE
Lake Helen	NA	NA	NONE	NEXT PAGE
New Smyrna Beach	68	30	30 RESIDENTIAL	NEXT PAGE
Oak Hill	NA	NA	NONE	NEXT PAGE
Orange City	NA	NA	NONE	NEXT PAGE
Ormond Beach	36	16	16 RESIDENTIAL	NEXT PAGE
Pierson	NA	NA	NONE	NEXT PAGE
Ponce Inlet	4	2	2 RESIDENTIAL	NEXT PAGE
Port Orange	76	35	35 RESIDENTIAL	NEXT PAGE
South Daytona	8	4	4 RESIDENTIAL	NEXT PAGE
Volusia County	165	76	74 RESIDENTIAL, 1 COMMERCIAL, 1 INSTITUTIONAL	NEXT PAGE
<b>TOTAL</b>	<b>441</b>	<b>203</b>	190 RESIDENTIAL, 5 COMMERCIAL, 8 INSTITUTIONAL	NEXT PAGE

### 5.10.6 Probability of Future Occurrences

Flood events will remain a frequent occurrence in Volusia County, and future probability of occurrences is high. The probability of future flood events based on magnitude and according to best available data is illustrated in Figure 5.10, which indicates those areas susceptible to the 1 percent annual chance flood (100-year floodplain); the 1 percent annual chance flood with wave action (100-year coastal floodplain); and the 0.2 percent annual chance flood (500-year floodplain). Further, as described in other hazard profiles, it is highly likely that Volusia County will continue to experience inland and coastal flooding associated with large tropical storms, hurricanes and storm surge events.

Anticipated sea level rise will increase the probability and intensity of future tidal flooding. Rising sea level over time will decrease the return period (increasing the frequency) of significant flood events. For example; sea level rise of 1 foot over a typical project analysis period (50 years) may cause a flood event currently of annual probability 2 percent (50-year flood) to become an event of 10 percent annual probability (10-year flood). This rise in sea level will increase the probability of the loss of coastal wetlands and erosion of sand beaches that act as protective buffers against flood events.

## SECTION 5: HAZARD PROFILES

There are repetitive loss properties within 9 of the 16 jurisdictions within Volusia County. These 203 properties have experienced 431 total flood events, an average of 2.12 events per property. Countywide distribution of repetitive loss properties is somewhat weighted to the east, as a majority of the repetitive loss properties in the county are in the Daytona Beach, New Smyrna Beach and Ormond Beach areas (approximately 72% of incorporated parcels). The western side of the county also has a number of repetitive loss properties, most notably the cluster within the Stone Island residential area in the southwestern portion of the county. Table 9 analyzes the Repetitive properties by jurisdiction. Data collected showed that the majority of properties have not undergone mitigation efforts; however there is insufficient data to measure an actual percentage for the entire county. Preliminary findings show, with a high degree of confidence, that the percent of repetitive loss properties that have been mitigated is well-below the 50% level.

**Repetitive Loss Analysis Summary by Jurisdiction**

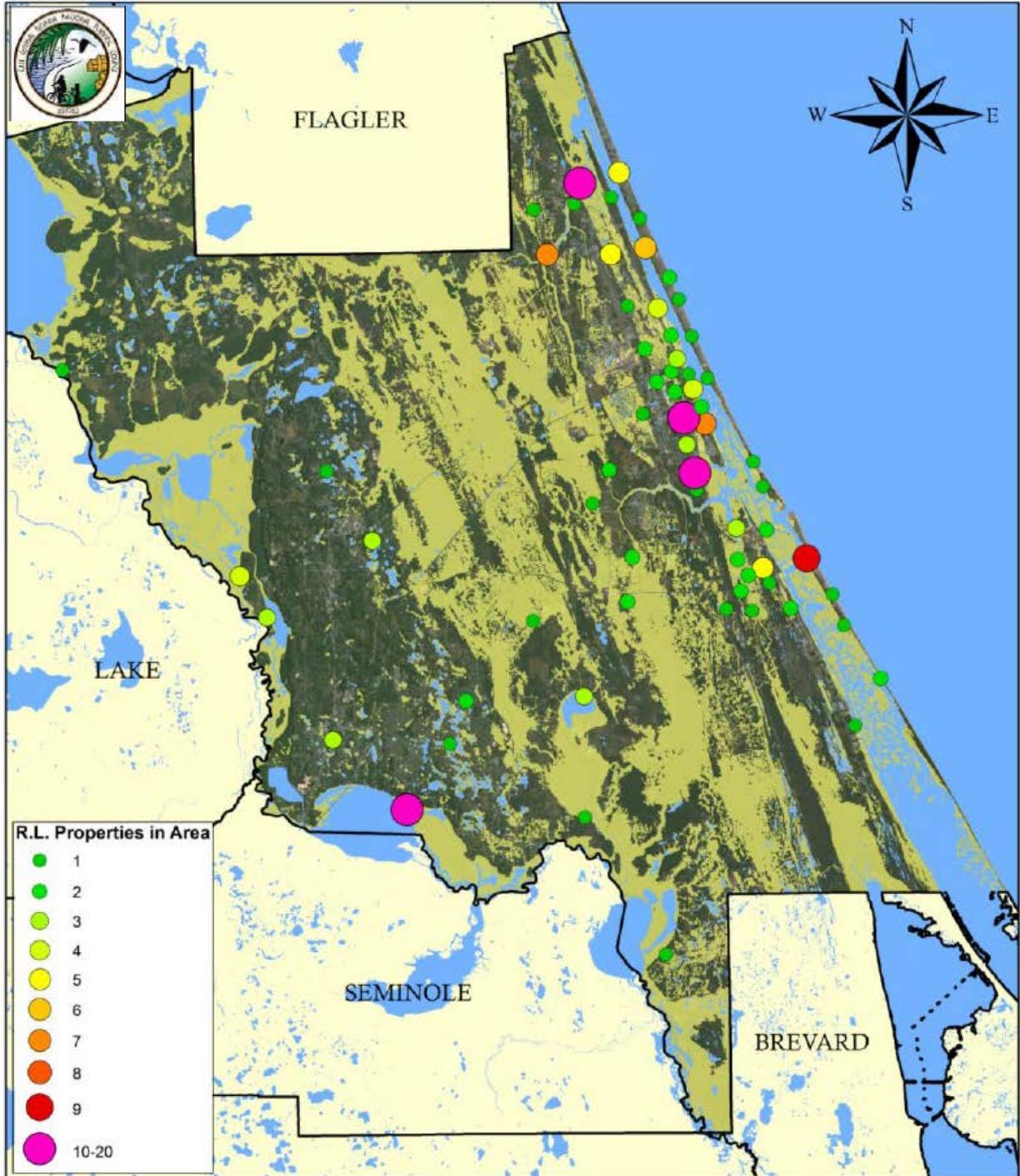
Municipality	# RLA Properties	# RLA Losses	% RLA Mitigated	% RLA Not Mitigated	% RLA Mitigation Unknown	% RLA Insured	% RLA Not Insured	% RLA Insurance Unknown
Daytona Beach	32	64	0.00%	50.00%	50.00%	28.13%	25.00%	46.88%
Daytona B. Shores	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DeBary	3	6	0.00%	0.00%	100.00%	100.00%	0.00%	0.00%
DeLand	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Deltona	3	8	0.00%	0.00%	100.00%	66.67%	33.33%	0.00%
Edgewater	2	4	0.00%	50.00%	50.00%	0.00%	50.00%	50.00%
Holly Hill	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lake Helen	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
New Smyrna Bch.	30	60	16.67%	83.33%	0.00%	76.67%	23.33%	0.00%
Oak Hill	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Orange City	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ormond Beach	16	36	56.30%	43.70%	0.00%	50.00%	50.00%	0.00%
Pierson	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ponce Inlet	2	4	0.00%	0.00%	100.00%	0.00%	0.00%	100.00%
Port Orange	35	76	11.43%	88.57%	0.00%	65.71%	31.43%	2.86%
South Daytona	4	8	0.00%	0.00%	100.00%	80.00%	20.00%	0.00%
Unincorporated	76	165	0.00%	2.63%	97.37%	72.37%	27.63%	0.00%
<b>Countywide</b>	<b>202</b>	<b>431</b>						

**Financial and Future Land Use Summary of Repetitive Loss Areas by Jurisdiction**

Municipalities	REPETITIVE LOSS AREA FINANCIAL SUMMARY			REPETITIVE LOSS AREA FUTURE LAND USE SUMMARY						
	RLA Land Value	RLA Property Value	RLA Taxable Value	% Low Density Residential	% Med-Hi Residential	% Commercial	% Mixed Use	% Recreation	% Agriculture	% Planned Development
Daytona Beach*	\$10,506,366	\$52,010,187	\$46,493,916	37.5%	34.4%	9.4%	15.6%	3.1%	0%	0%
Daytona B Shores	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
DeBary	\$60,000	\$229,906	\$171,906	100.00%	0%	0%	0%	0%	0%	0%
DeLand	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Deltona	\$44,112	\$111,207	\$61,358	0%	100.0%	0%	0%	0%	0%	0%
Edgewater	\$26,703	\$100,681	\$75,181	100.00%	0%	0%	0%	0%	0%	0%
Holly Hill	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Lake Helen	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
New Smyrna B	\$2,058,417	\$3,801,486	\$3,568,549	63.3%	30.0%	6.7%	0%	0%	0%	0%
Oak Hill	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Orange City	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Ormond Beach	\$2,517,950	\$3,514,759	\$3,288,759	87.5%	12.5%	0%	0%	0%	0%	0%
Pierson	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Ponce Inlet	\$336,539	\$745,938	\$557,937	100.00%	0%	0%	0%	0%	0%	0%
Port Orange	\$772,483	\$2,931,757	\$2,286,804	80.6%	11.1%	2.8%	2.8%	0%	0%	2.8%
South Daytona	\$600,082	\$1,153,758	\$1,103,758	50.0%	25.0%	0%	25.0%	0%	0%	0%
Unincorporated	\$8,829,424	\$14,108,780	\$12,523,349	72.4%	11.8%	0%	0%	6.6%	9.2%	0%
<b>Countywide</b>	<b>\$25,752,076</b>	<b>\$78,708,459</b>	<b>\$70,131,517</b>	<b>67.3%</b>	<b>19.5%</b>	<b>2.9%</b>	<b>3.4%</b>	<b>2.9%</b>	<b>3.4%</b>	<b>0.5%</b>

\*Note: Two beachside hotels in Daytona Beach account for \$48.2 million in property value, skewing the jurisdiction-wide value

# Repetitive Loss Areas



Sources: FEMA, Volusia County DEM and Jurisdictions, 2013

## **5.11 STORM SURGE**

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### **5.11.1 Background**

Storm surge occurs when the water level of a tidally influenced body of water increases above the normal astronomical high tide and is most common in conjunction with coastal storms with massive low-pressure systems with cyclonic flows such as hurricanes, tropical storms and nor'easters. The low barometric pressure associated with these storms causes the water surface to rise, and storms making landfall during peak tides have surge heights and more extensive flood inundation limits. Storm surges will inundate coastal floodplains by dune overwash, tidal elevation rise in inland bays and harbors, and backwater flooding through coastal river mouths. The duration of a storm is the most influential factor affecting the severity and impact of storm surges.

A storm surge is often described as a wave that has outrun its generating source and become a long period swell. It is often recognized as a large dome of water that may be 50 to 100 miles wide and generally rising anywhere from four to five feet in a Category 1 hurricane to over 20 feet in a Category 5 storm. The storm surge arrives ahead of the storm center's actual landfall and the more intense the storm is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas. The surge is always highest in the right-front quadrant of the direction in which the storm is moving. As the storm approaches shore, the greatest storm surge will be to the north of the low-pressure system or hurricane eye. Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate shoreline.

Storm surge heights and associated waves are dependent on not only the storm's intensity but also upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. The storms that generate the largest coastal storm surges can develop year-round, but they are most frequent from late summer to early spring.

### **5.11.2 Location and Spatial Extent**

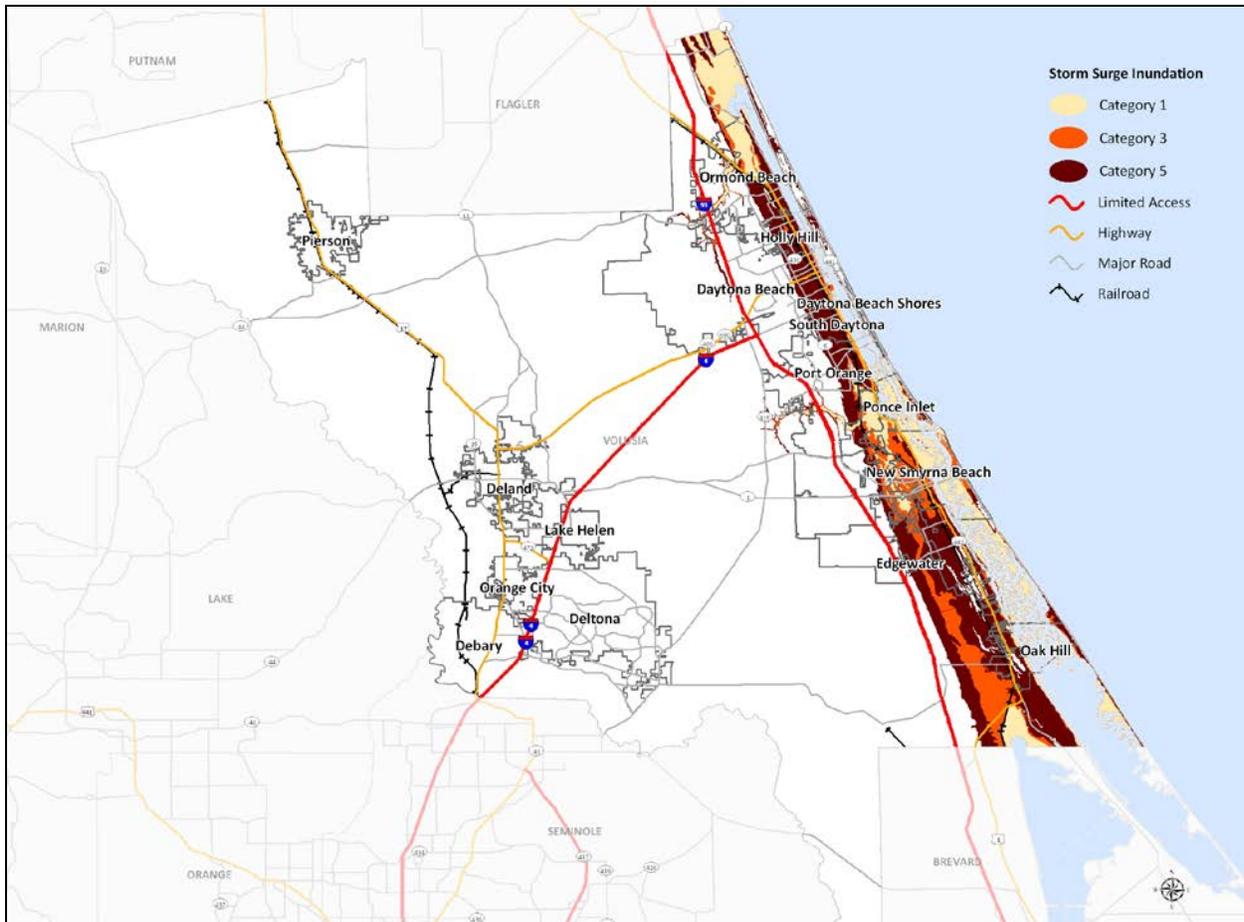
Many areas in Volusia County are subject to potential storm surge inundation. **Figure 5.11** illustrates hurricane storm surge inundation zones for Volusia County derived from geo-referenced SLOSH (Sea, Lake and Overland Surge from Hurricanes) data produced by the USACE in coordination with NOAA. SLOSH is a modeling tool used to estimate storm surge for coastal areas resulting from historical, hypothetical or predicted hurricanes taking into account maximum expected levels for pressure, size, forward speed, track and winds. Therefore, the SLOSH data is best used for defining the potential maximum surge associated with various storm intensities for any particular location.

As shown in the figure, all of Volusia County's coastal areas are at high risk to storm surge inundation in addition to most riverine floodplains along major rivers in southern portions of the area. While areas not located immediately along the coast or major rivers may not be directly impacted by storm surge

## SECTION 5: HAZARD PROFILES

inundation except in extreme storm events, they might experience flooding caused by storm surge and extremely high tides that affect the drainage of areas further inland.

**FIGURE 5.11: Storm Surge Inundation Zones in Volusia County**



Source: National Oceanic and Atmospheric Administration – Note: More detailed map available in next section of the report.

### 5.11.3 Historical Occurrences

Volusia County has experienced storm surge events associated with hurricanes, nor'easters and tropical storms. Please reference the **Hurricane Historical Occurrences** listing for more information. Water can rise to exceptional levels during hurricane, storm surge, flash flood and thunderstorm conditions. Water levels from storm surge have historically risen up to 6 feet within Volusia County following one of these events, with increased water heights for coastal communities due to Florida's semidiurnal tides. Roadway flooding has been seen rising between 1 and 5 feet.

### 5.11.4 Probability of Future Occurrences

There is a high probability that Volusia County will continue to experience storm surge associated with large tropical storms, hurricanes and squalls combined with high tides, based on the frequency of past

## SECTION 5: HAZARD PROFILES

tropical cyclones. As noted in the preceding section (under *Flood*), anticipated sea level rise will increase the probability and intensity of future storm surge events. This rise in sea level will increase the probability and intensity of tidal flooding events, but will also contribute to the loss of coastal wetlands and erosion of sand beaches that act as protective buffers against storm surge events.

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hurricanes that future mitigation and adaptation strategies related to this hazard should be considered.

## GEOLOGIC HAZARDS

### 5.12 SINKHOLE

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#### 5.12.1 Background

Sinkholes are a natural and common geologic feature in areas with underlying limestone and other rock types that are soluble in natural water. Most limestone is porous, allowing the acidic water of rain to percolate through their strata, dissolving some limestone and carrying it away in solution. Over time, this persistent erosional process can create extensive underground voids and drainage systems in much of the carbonate rocks. Collapse of overlying sediments into the underground cavities produces sinkholes.

The three general types of sinkholes are: subsidence, solution, and collapse. *Subsidence sinkholes* form gradually where the overburden (the sediments and water that rest on the limestone) is thin and only a veneer of sediments is overlying the limestone. *Solution sinkholes* form where no overburden is present and the limestone is exposed at land surface. *Collapse sinkholes* are most common in areas where the overburden is thick, but the confining layer is breached or absent. Collapse sinkholes can form with little warning and leave behind a deep, steep-sided hole. Sinkholes occur in many shapes, from steep-walled holes to bowl or cone shaped depressions. Sinkholes are dramatic because the land generally stays intact for a while until the underground spaces get too big. If there is not enough support for the land above the spaces, then a sudden collapse of the land surface can occur. Under natural conditions, sinkholes form slowly and expand gradually. However, human activities such as dredging, constructing reservoirs, diverting surface water and pumping groundwater can accelerate the rate of sinkhole expansions, resulting in the abrupt formation of collapse sinkholes.

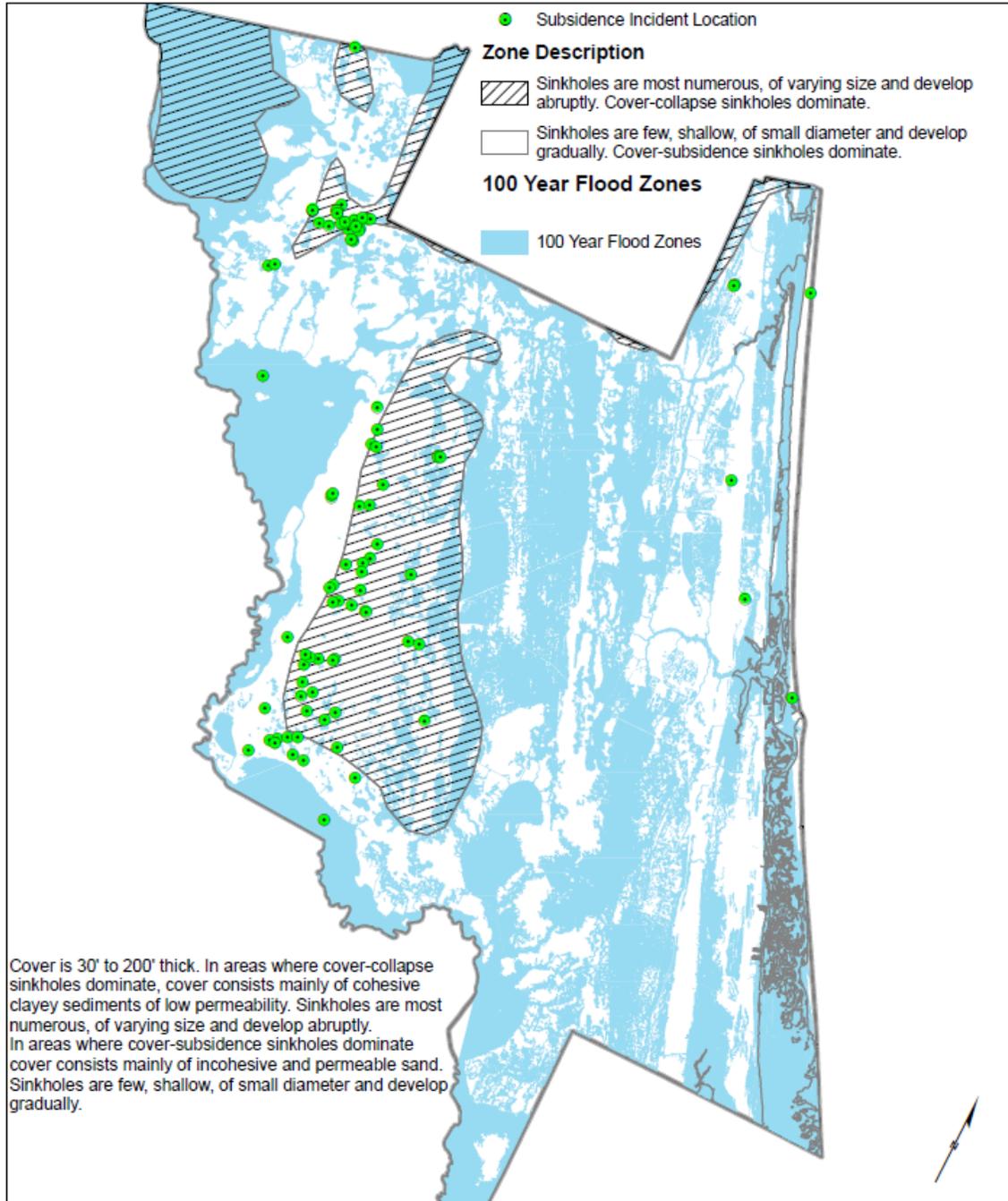
Although a sinkhole can form without warning, specific signs can signal potential development:

- Slumping or falling fence posts, trees or foundations;
- Sudden formation of small ponds;
- Wilting vegetation;
- Discolored well water; and/or
- Structural cracks in walls, floors.

Sinkhole formation is exacerbated by urbanization. Development increases water usage, alters drainage pathways, overloads the ground surface and redistributes soil. According to FEMA, the number of human-induced sinkholes has doubled since 1930 and insurance claims for damages as a result of sinkholes has increased 1,200 percent from 1987 to 1991, costing nearly \$100 million.

**5.12.2 Location and Spatial Extent**

Sinkholes are typically localized occurrences that cannot be mapped to any specific geographic boundaries. The map below depicts sinkhole locations within Volusia County, Florida.



**Volusia County, Florida  
Subsidence Incidents / Sinkholes - January 1973 to January 2013**

Source: Subsidence Data - FL Geological Survey, October 2014; Sinkhole Zone Data - FL DEP, 2010; Flood Zone Data - FEMA Feb 2014.  
Prepared by Volusia County IT/GIS March 24, 2015

## SECTION 5: HAZARD PROFILES

The American Society of Civil Engineers measured a number of Florida sinkholes and concluded that their sample had average depth of 3.4 meters (11.2 feet). This figure is geographically relevant to Volusia County; however the breadth of size of sinkholes can vary widely depending on the context of the earth subsurface. Sinkholes can be relatively shallow (less than two meters) or extremely deep (tens of meters), and therefore can have extremely large or small diameters, ranging in size from one-to-two meters to tens of meters.

### 5.12.3 Historical Occurrences

There were 80 sinkholes in Volusia County between 1973 and 2005. **Figure 5.12** shows the location of these sinkholes. Seventy-eight of these sinkholes were located in the Volusia County study area as shown in **Table 5.17**, as reported to the NCDC. In 2004 there was a major sinkhole that occurred in DeLand. In December 2004, a sinkhole devoured a 160-foot area, swallowing all four lanes of Howland Boulevard, cracked the walls of a nearby home and caused the evacuation of 20 homes. It was estimated that it would take 1 million cubic yards of dirt to the fill the hole. In 2005, a 250 foot by 150 foot sinkhole opened in Volusia County, and sinkholes with depths as great as 50 feet have been observed within the County. These conditions can be expected in the future within Volusia County

Please reference the sinkhole portion of section 6 for a map depicting all historical sinkhole locations in East Central Florida.

**TABLE 5.17: Historical Sinkholes in Volusia County**

LOCATION	DATE	SIZE (feet)			DETAILS
		Length	Width	Depth	
Pierson	12/12/1973	60.00	60.00	0.00	There are many small lakes in the area. The sinkhole was adjacent.
Pierson	12/13/1973	100.00	100.00	40.00	Depth varies from 20' to 40'. It happened during pumping for freeze protection.
Pierson	12/17/1973	10.00	10.00	2.00	None
Pierson	12/15/1975	25.00	25.00	20.00	It happened during pumping for freeze protection.
Pierson	1/10/1976	3.00	3.00	1.00	It happened during pumping for freeze protection.
Pierson	12/1/1976	15.00	15.00	0.00	None
Pierson	1/15/1977	0.00	0.00	0.00	None
Pierson	1/19/1977	30.00	30.00	12.00	Near other small sinks and lakes.
Orange City	4/10/1977	70.00	70.00	50.00	Near 501
Pierson	1/3/1979	39.00	32.00	0.00	None
Pierson	1/9/1979	22.00	27.00	7.00	None
Pierson	1/9/1979	19.00	16.00	3.00	None

## SECTION 5: HAZARD PROFILES

**TABLE 5.17: Historical Sinkholes in Volusia County**

LOCATION	DATE	SIZE (feet)			DETAILS
		Length	Width	Depth	
DeLand	4/17/1979	6.00	6.00	10.00	None
DeLand	1979	9.00	9.00	4.00	None
DeLand	7/16/1981	13.00	13.00	18.00	None
DeLand	10/27/1981	3.00	3.00	8.00	None
Pierson	12/15/1981	50.00	50.00	20.00	A sink also occurred here in 1973.
Orange City	1/9/1982	2.00	2.00	2.00	None
Debary	4/9/1982	20.00	20.00	15.00	None
DeLand	4/11/1982	7.25	6.50	3.33	None
DeLand	4/14/1982	3.00	3.00	1.00	Occurred at the national guard armory.
Lake Helen	7/25/1982	4.00	3.00	3.00	None
Orange City	10/4/1982	12.00	12.00	6.00	None
Holly Hills	4/7/1983	20.00	0.00	15.00	None
New Smyrna Beach	5/28/1983	5.00	0.00	7.00	There are multiple holes in the area varying from 1 to 5 feet in diameter and 2 to 7 feet deep.
Pierson	12/26/1983	130.00	100.00	35.00	None
Pierson	12/26/1983	50.00	50.00	35.00	Very cold at this time, pumping for freeze protection.
Pierson	12/26/1983	10.00	10.00	0.33	Very cold at this time, pumping for freeze protection.
Pierson	12/26/1983	15.00	15.00	0.60	Very cold at this time, pumping for freeze protection.
Pierson	12/26/1983	25.00	25.00	20.00	Very cold at this time, pumping for freeze protection. Occurred next to a fernery.
Orange City	4/24/1984	7.00	7.00	6.00	Approximately 200 yards from ST 17-92, in the center of the west bound lane.
Seville	1/21/1985	60.00	60.00	25.00	Many wells in the area went dry. Sink in the northeast corner of Crystal Lake which has been dry for months. Six days later, the sink was filled with water, but no rain. Heavy freeze protection pumping at this time.
Pierson	1/21/1985	20.00	20.00	3.00	Six Sinks in the area. Heavy freeze protection pumping at this time.
Pierson	1/21/1985	10.50	12.75	4.00	Six Sinks in the area. Heavy freeze

## SECTION 5: HAZARD PROFILES

**TABLE 5.17: Historical Sinkholes in Volusia County**

LOCATION	DATE	SIZE (feet)			DETAILS
		Length	Width	Depth	
					protection pumping at this time.
Pierson	1/21/1985	62.00	62.00	15.00	Six Sinks in the area. Heavy freeze protection pumping at this time.
Pierson	1/21/1985	53.00	50.00	12.00	Six Sinks in the area. Heavy freeze protection pumping at this time.
Pierson	1/21/1985	20.00	26.00	2.00	Six Sinks in the area. Heavy freeze protection pumping at this time.
Orange City	10/13/1985	35.00	25.00	0.13	Settlement causing cracks and distortion to house. The sink is completely under the house. Cement pressure grouting will be performed Jammal and Associates report.
Pierson	1/29/1986	23.20	21.70	7.00	Near other sinkholes.
DeLand	2/1/1986	5.00	4.00	4.50	This sinkhole is on the slope of Lake Louise.
Port Orange	4/3/1987	10.00	10.00	1.00	None
Orange City	5/19/1987	95.00	95.00	1.00	Reactivation of ancient sink.
Pierson	5/27/1987	48.00	28.00	10.00	Sinkhole on divide between stone pond and unnamed pond. .
Pierson	5/29/1987	0.00	0.00	3.00	None
DeLand	9/1/1987	5.50	6.50	11.00	A backhoe operator drove up to the edge of the area and it suddenly collapsed.
DeLand	3/17/1989	13.00	13.00	10.00	S.R. 11 – The sink is in the right of way on the west side of the highway.
Orange City	10/31/1991	22.00	22.00	20.00	1910 Clara Ave, residence.
Orange City	3/7/1993	130.00	130.00	35.00	825 & 835 Lansdowne Ave.
Orange City	3/7/1993	15.00	15.00	1.00	560 Marilea Ct.
Orange City	5/8/1994	50.00	50.00	25.00	581 Sparkman Ave
Orange City	8/29/1994	5.00	5.00	1.50	I-4 at the Saxon Boulevard Ramp
DeLand	8/24/1995	10.00	8.00	5.00	Sinkhole is in backyard.
DeLand	1/10/1996	5.00	5.00	2.00	Located at Old Reynolds Road.
DeLand	1/10/1996	50.00	50.00	11.00	Located at Old Reynolds Road.
Deltona	10/12/1996	0.00	0.00	0.00	Located at a residence.
DeLand	8/30/1998	18.00	18.00	5.00	U.S. HWY 17/92 in DeLand located on the east side of the highway in bank driveway.

## SECTION 5: HAZARD PROFILES

**TABLE 5.17: Historical Sinkholes in Volusia County**

LOCATION	DATE	SIZE (feet)			DETAILS
		Length	Width	Depth	
Debary	5/26/2000	0.00	0.00	0.00	148 MARSELLA Road in a Debary housing subdivision. One home deemed unsafe and two have structural damage.
Lake Helen	6/14/2000	1.00	1.00	3.00	Located on west Main Street under a home; it is not causing structural damage.
DeLand	7/21/2000	25.00	25.00	15.00	The sinkhole is located under a home that is under construction. No structural damage to home.
Orange City	8/26/2000	3.00	3.00	3.00	Sinkhole is still growing; 20 feet from structure.
Orange City	9/22/2000	2.00	2.00	10.00	Sinkhole is 6 feet from structure. No structural damage on private property.
Sanford	9/28/2000	5.00	5.00	3.00	DEBARY. STATION 28+35, Located 5 feet right of Benson Junction Road.
Debary	10/17/2000	2.00	2.00	6.00	Located on private property.
Pierson	12/21/2000	50.00	50.00	15.00	Located on Shaw Lake Road between Turner Road and Hilsenbeck Road. Ten feet from South side of the road. . .
Pierson	12/21/2000	30.00	35.00	35.00	A portion of Shaw Lake Road was barricaded due to sinkhole impact.
DeLand	12/29/2000	35.00	35.00	3.00	A sinkhole occurred 50 feet from structure but structure is stable at this time.
DeLand	3/22/2001	6.00	4.00	5.00	Sinkhole was located in the road. A garbage truck hit it. It is now being repaired.
DeLand	4/30/2001	20.00	20.00	3.00	Sink occurred on private property near a retention pond.
Debary	7/18/2001	4.00	4.00	2.00	Sink on private property.
Welaka	10/15/2001	7.00	7.00	1.50	U.S. 17 North of Seville going southbound.
Orange City	8/25/2002	3.00	3.00	0.00	Closed one land of road to repair sink in right of way.
Orange City	9/30/2002	6.00	6.00	2.00	Sinkhole in intersection.
Orange City	1/15/2003	5.00	5.00	0.50	Half inch pavement dip.
DeLand	6/2/2004	15.00	15.00	8.00	Sinkhole in the road. No damage or injuries occurred.
DeLand	9/8/2004	4.00	4.00	2.50	Sinkhole on private property; no damage.

## SECTION 5: HAZARD PROFILES

**TABLE 5.17: Historical Sinkholes in Volusia County**

LOCATION	DATE	SIZE (feet)			DETAILS
		Length	Width	Depth	
DeLand	9/29/2004	25.00	25.00	20.00	Sinkhole on private property. The hole is partly under the garage. The owner was advised not to stay in the home until the sinkhole is fixed.
Deltona	12/18/2004	225	175	50	Destroyed 4-lanes of Howland Blvd.; largest sinkhole on record for Volusia County
Orange City	1/9/2005	250.00	150.00	0.00	Sinkhole damaged 2 homes beyond repair and is also impacting road.
Osteen	8/17/2005	4.00	2.00	2.00	Sinkhole on private property.
Lake Dias	8/17/2005	4.00	4.00	3.00	None

Source: National Climatic Data Center (data not available from this source post-2005)

Volusia County Geographic Information Systems (GIS) has compiled a listing of all sinkholes that have occurred since August 17, 2005. The listing is provided below:

Reference #	Date	Longitude	Latitude	County	City	Trigger
79-544	8/26/08	-81.321	28.8988	VOLUSIA	DeBary	Unknown
79-545	8/27/08	-81.2517	28.8975	VOLUSIA	Deltona	Unknown
79-546	10/2/08	-81.0583	29.206	VOLUSIA	Daytona Beach	Unknown
79-547	10/9/08	-81.2271	28.8838	VOLUSIA	Deltona	Unknown
79-044	10/13/08	-81.2665	28.9198	VOLUSIA	Deltona	Excessive Rainfall
79-548	7/2/11	-81.07076	29.3563	VOLUSIA	Ormond Beach	Unknown
79-549	1/24/13	-81.338	29.10877	VOLUSIA	DeLeon Springs	Drought or Low Water Table

### 5.12.4 Probability of Future Occurrences

There is a high probability of future sinkhole occurrences in Volusia County. The county averages 2.5 sinkholes annually, according to the historic data. Activities that increase the risk of sinkhole are ground-water pumping, construction and development practices, and breakages in water lines, though they can also occur due to natural or geological factors. The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from hail and that future mitigation and adaptation strategies related to this hazard should be considered.



### 5.13 TSUNAMI

#### 5.13.1 Background

The word tsunami is Japanese and means “harbor wave.” A tsunami is a wave or series of waves most commonly caused by an earthquake or by a large undersea landslide, volcanic eruption or other undersea disturbance. From the area of disturbance, tsunami waves will travel outward in all directions and can originate hundreds or even thousands of miles away from affected coastal areas.

In the open ocean, tsunami waves travel at speeds of up to 600 miles per hour but are too small to be observed, and the time between wave crests may be five to 90 minutes. As the waves approach shallow coastal waters, they slow down and may rise to several feet or, in rare cases, tens of feet. Although the waves slow down as they reach shallow water, the energy remains constant and when tsunami waves crash into the shoreline they may be as high as 100 feet. The first wave is almost never the largest; successive waves may be spaced tens of minutes apart and continue arriving for many hours. The coastal areas at greatest risk are less than 50 feet above sea level and within one mile of the shoreline. Tsunamis can cause great loss of life and property damage where they come ashore, and most tsunami deaths are the result of drowning. Associated risks include water pollution, damaged gas lines, and flooding.

Tsunami activity is a greater risk along the Pacific Rim states (Washington, Oregon, California Alaska and Hawaii), but is still possible along the East Coast of the United States. In fact, as many as 40 tsunami or tsunami-like events have been reported along the East Coast since the early 1600s. Additionally, models and methodologies do not currently exist to accurately assess the tsunami hazard as it would relate to an inland community along the East Coast.

Although an East Coast tsunami would be rare, two off-shore areas are currently under investigation according to a 2002 National Geophysical Data Center report. One area of interest consists of large cracks northeast of Cape Hatteras, North Carolina that could foretell of the early stages of an underwater landslide resulting in a tsunami. The other area of interest consists of submarine canyons approximately 150 kilometers from Atlantic City, New Jersey. Significant factors for consideration with regard to these areas are recent discoveries along the East Coast that demonstrate the existence of pressurized hydrates and pressurized water layers in the continental shelf. This has produced speculation among the scientific community on possible triggers that could cause sudden and perhaps violent releases of compressed material that could factor into landslide events and the resulting tsunami waves.

In August 2008, a qualitative tsunami hazard assessment prepared by NOAA and USGS indicated that the U.S. Atlantic coast has a very low tsunami risk<sup>17</sup>. This qualitative assessment was based on National Geophysical Data Center (NGDC) and United States Geological Survey (USGS) databases. Specifically, Atlantic coast tsunami vulnerability was deemed very low based on very low wave runup, low tsunami hazard frequency, and no reported fatalities.

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<sup>17</sup> NOAA and USGS. 2008. *U.S. States and Territories National Tsunami Hazard Assessment: Historical Record and Sources for Waves*. August 2008.

# SECTION 5: HAZARD PROFILES

## 5.13.2 Location and Spatial Extent

The potential location and extent of the tsunami hazard for Volusia County is similar and slightly more extensive than the established flood hazard area. A tsunami event could cover all or any part of Volusia County. However, the coastal areas are most at risk.

**Figure 5.13** indicates the areas in Volusia County most at risk to a tsunami hazard based on the location of the 500 year tsunami inundation zone based on MEMPHIS data. The coastal areas are at the greatest risk to high velocity waves that could cause severe to catastrophic damage to structures and infrastructure. Specifically, massive amounts of vegetative and construction debris would result, boats would be washed ashore, impacted buildings could collapse, trees could be uprooted, above ground power poles and lines could collapse, and underground utilities could be unearthed and destroyed. Tsunami size is a function of the intensity of an underlying earthquake (see the Richter scale, below), as well as factors specific to the shape (or bathymetry) where the seismic activity occurs. For example, the “Boxing Day” tsunami that struck southern Asia in 2004 was located on an elongated ridge within the deep Indian Ocean. The elongation of the ridge considerably increased the linear mileage of coastline that were struck by the tsunami within the northeastern hemisphere and inflicted more damage on some coastlines than others. Below is a figure depicting the Richter Scale.

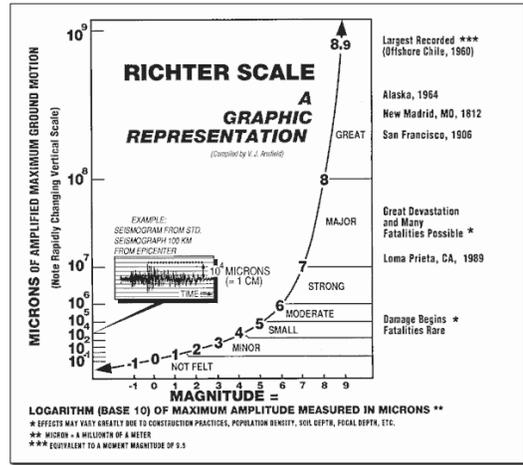
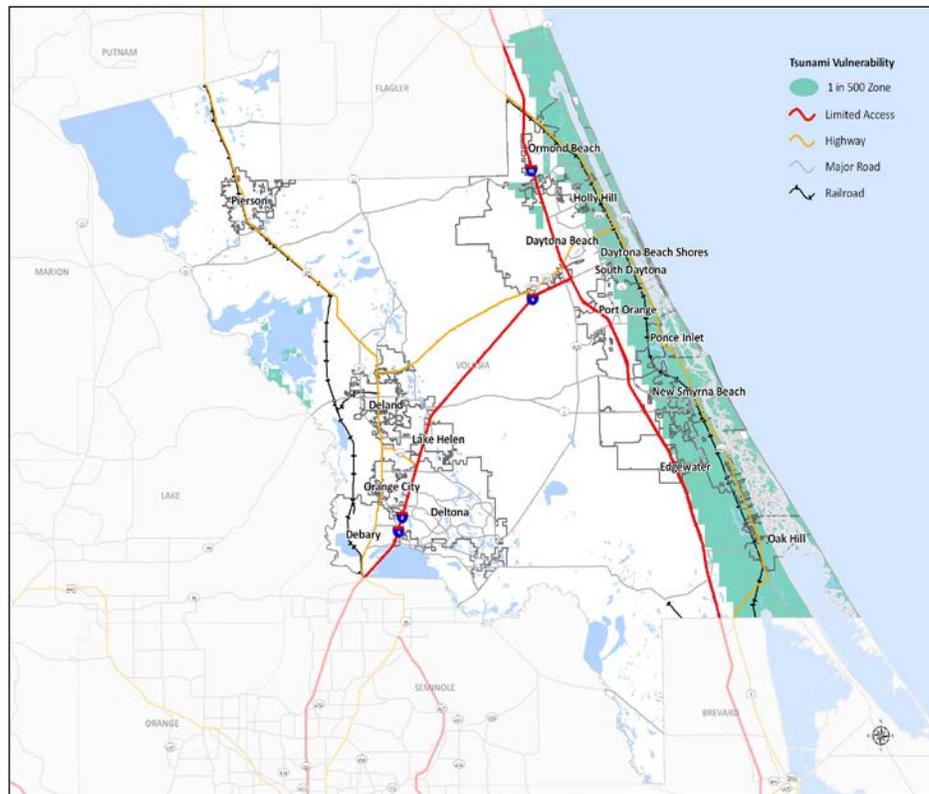


Image: Richter Scale Graphic Representation

### 13: Tsunami Vulnerability Areas



### **5.13.3 Historical Occurrences**

Historical records do not indicate any past significant tsunami occurrences for Volusia County, and such an event is generally considered possible but unlikely. However, the potential for tsunami impacts along the entire Eastern United States coast does exist as evidenced by other recorded tsunami occurrences in the area.

Although different from a tsunami, a rogue wave is a relatively large (i.e., larger in height than a tsunami) and spontaneous ocean wave that can cause similar impacts. On July 3 1992, a 27 mile long, 18 foot rogue wave came onshore between Ormond Beach to New Smyrna Beach, centered at Daytona Beach. Sailboats crashed ashore, 200 cars were damaged and approximately 75 people were injured resulting in two hospitalizations. It is theorized that an underwater landslide caused the rogue wave, potentially categorizing this wave as a type of tsunami, or it was the result of a squall line.

### **5.13.4 Probability of Future Occurrences**

The probability of a future tsunami event affecting Volusia County is considered to be very low, as indicated in the 2008 NOAA-USGS tsunami hazards assessment. However, the consequences of even a moderate tsunami striking Volusia County would be devastating to lives, development, and the ability of the county to function.

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from tornadoes and that future mitigation and adaptation strategies related to this hazard should be considered.

### OTHER HAZARDS

#### 5.14 WILDFIRE

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##### 5.14.1 Background

A wildfire is any fire occurring in a wildland area (i.e. grassland forest, brush land) except for fire under prescription.<sup>18</sup> Wildfires are part of the natural management of forest ecosystems, but may also be caused by human factors. Nationally, over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

There are three classes of wildland fires: surface, ground and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around.

Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural hazards (such as tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings. Forest damage from hurricanes and tornadoes may also block interior access roads and fire breaks; pull down overhead power lines, or damage pavement and underground utilities.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses and industries are located within high wildfire hazard areas. Further, the increasing demand for outdoor recreation places more people in wild lands during holidays, weekends and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for wildfire events that can sweep through the brush and timber and destroy property within minutes.

Wildfires can result in severe economic losses as well. Businesses that depend on timber, such as paper mills and lumber companies, often experience losses that are passed along to consumers through higher prices. In cases, this has resulted in the loss of jobs. The high cost of responding to and recovering from wildfires can deplete state resources and increase insurance rates. The economic impact of wildfires can also be felt in the tourism industry if roads and tourist attractions are closed due to health and safety concerns.

State and local governments can impose fire safety regulations on home sites and developments to help curb wildfire. Land treatment measures such as fire access roads, water storage, helipads, safety zones, buffers, firebreaks, fuel breaks and fuel management can be designed as part of an overall fire defense

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<sup>18</sup> Prescription burning, or “controlled burn,” undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

## SECTION 5: HAZARD PROFILES

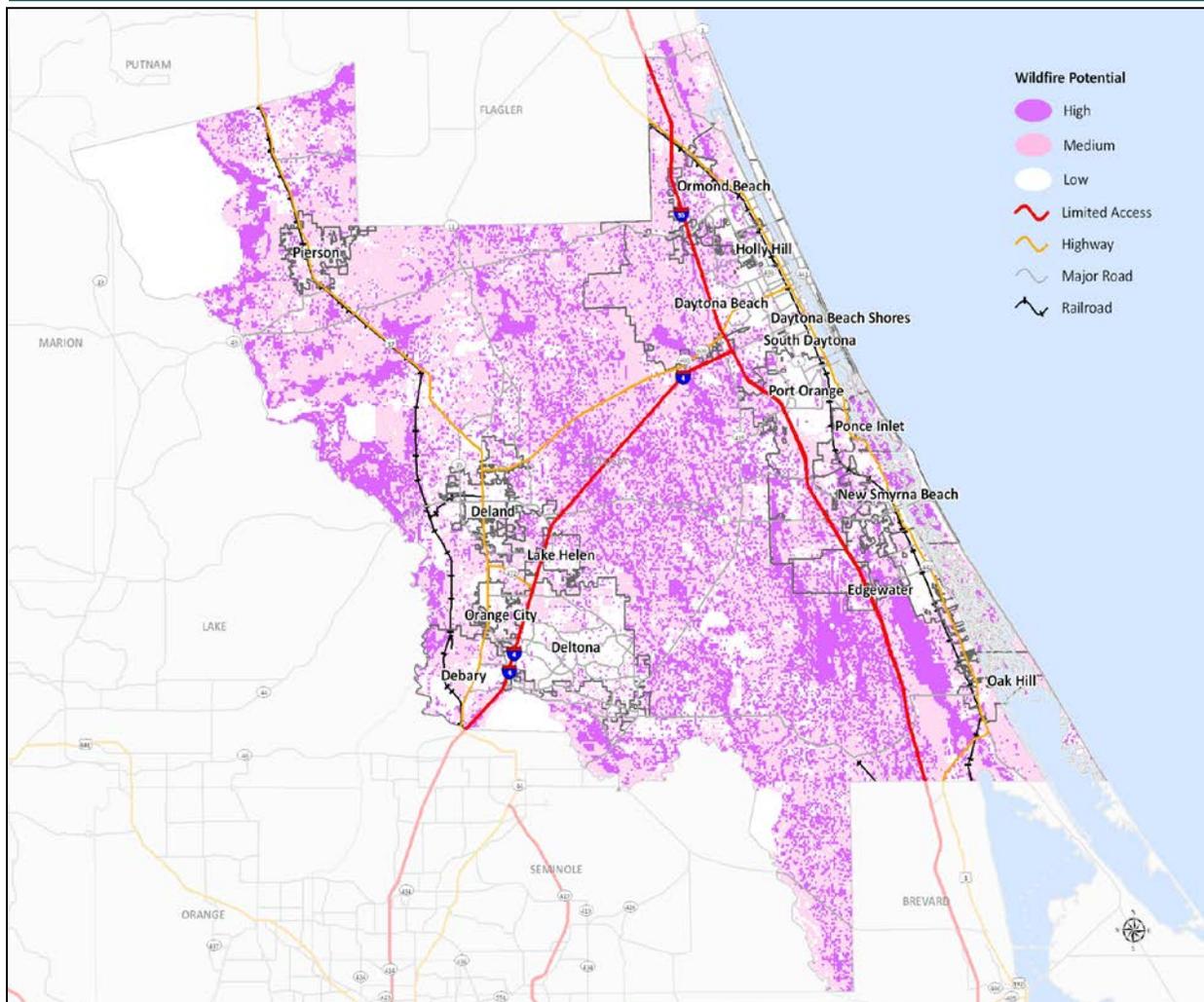
system to aid in fire control. Fuel management, prescribed burning and cooperative land management planning can also be encouraged to reduce fire hazards.

### 5.14.2 Location and Spatial Extent

Volusia County is uniformly exposed to wildfire risk. Although the county typically receives a high amount of precipitation each year (around 50 inches), there is risk of wildfire due to the hot, dry summer months. Further, drought and drought-like conditions may occur which could increase the probability of wildfire occurrence.

The wildfire potential for Volusia County is shown in **Figure 5.14**. All areas of the county may be susceptible to wildfire, and the wildland-urban interface is an area of concern as more property may be at risk to fire damage in these areas. Further, a large portion of the County is at high risk to wildfire events. These areas are dispersed throughout the County.

**FIGURE 5.14: Wildfire Risk in Volusia County**



Source: MEMPHIS --- Note: More detailed maps depicting fire risk are available in the next section of the report.

### 5.14.3 Historical Occurrences

According to the Florida Division of Forestry, Florida experiences an average of 3,060 wildfires annually, burning nearly 154,000 acres<sup>19</sup>. The most common cause of Florida wildfire events is lightning which ignited over 700 fires annually between 2000 and 2009. Volusia County experienced 1,306 fires that burned over 22,600 acres between January 2000 and August 2009. Lightning caused nearly half of these fires. **Table 5.18** lists the number of reported wildfire occurrences in Volusia County between the years 2000 and 2008.

**TABLE 5.18: Historical Wildfire Occurrences in Volusia County (2000-2008)\***

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	Annual Average
# of Fires	203	116	31	71	145	64	213	195	121	129
Acres Burned	2,043	383	371	2,011	746	198	5,037	1,826	1,482	1,566
YEAR	2009	2010	2011	2012	2013	2014				Annual Average
# of Fires	2	1	16	16	5	2				7
Acres Burned	885	154	22,006	4,352	2,534	703				5,106

Source: Florida Division of Forestry\*

It should also be noted that 1998 was a particularly significant year for wildfires in Volusia County. That year, drought conditions were prevalent throughout the County. A total of 233 wildfires were reported, the largest single cause being lightning. In all, over 163,000 acres were burned. The fires threatened 29,000 homes and hindered travel as wildfires jumped highways. However, after weeks of burning, just six houses, one mobile home, and two businesses were destroyed, totaling \$2.1 million (\$2,889,598; 2009 dollars). Timber, conversely, took the brunt of the damage with losses of over \$60 million (\$85,570,222; 2009 dollars). No fatalities or civilian injuries were reported but ten firefighters did have minor injuries.

These events have had devastating impacts on Volusia County. Homes and businesses have been damaged or destroyed, causing economic and social hardship, while a number of agricultural resources (such as timber, as described above) have been lost in these events. Families and vulnerable populations can be displaced temporarily or permanently by these events, while businesses can be lost forever. Human life is also at great risk to fires, as fires can quickly consume buildings and prevent escape. Smoke inhalation is a common cause of death due to fire, rather than the fire itself. Updating and enforcing building codes can help prevent fire disasters.

The largest fire recorded in Volusia County over the last five years was the Iron Horse Fire, which occurred in 2011 in southeastern Volusia County. Approximately 17,000 acres burned during this event, and a full Fire Operations Center (FOC) activation was executed. One mobile home, three outbuildings and three camp structures were destroyed, while 140 total structures were threatened. Interstate 95 was completely shut down due to smoke limiting driver visibility (intermittently over a two-day period), and a firefighter was injured during the event. Also in 2011, the Maytown Road Fire burned approximately 2,500 acres of land and affected local weather conditions by increasing cloud coverage. In 2012, a number of smaller fires affected the DeLand and DeBary areas of Volusia County.

<sup>19</sup> Average information based on information between January 2000 and August 2009.

In March 2013, the Durrance Road Fire destroyed 1,100 acres and forced evacuations of unincorporated areas of Volusia County near the Flagler County line west of Interstate 95. Approximately 300 homes were evacuated during this event. Interstate 95 from US1 to SR40 was shut down due to smoke.

### 5.14.4 Probability of Future Occurrences

There is a high probability of future wildfire events in Volusia County, especially during drought cycles and abnormally dry conditions, based on prior occurrence. Volusia County experienced nearly 130 wildfires per year from 2000 – 2008. This vulnerability analysis includes two maps (Wildfire Level of Concern, Wildfire Risk) that depict geographic risk points for fire hazards.

Based on the fire risk maps located in this report, the following acreage of the county is located within areas deemed as “high risk” and “very high risk” and could be vulnerable to fire. In terms of approximate burnable acreage within the county, these figures represent the areas at highest risk for a large fire outbreak.

- **High Risk: 4,272,081 acres**
- **Very High Risk: 1,672,519 acres**

The Local Mitigation Strategy recognizes that with a changing climate, there is a potential for an increasing risk of environmental impacts from wildfire and that future mitigation and adaptation strategies related to this hazard should be considered.

## **5.15 SOCIETAL AND TECHNOLOGICAL HAZARDS**

### **5.15.1 Background**

There are several hazards that are not a natural function of the Earth's atmosphere and climate within Volusia County, Florida, and these include technological and societal hazards. The environmental, economic and societal implications of the following societal and technological hazards are covered in Appendix H (HIRA Consequences) and Appendix J (Consequences by Hazard) of this report.

- **Cyber Attack**  
Cyber-attacks include the use of electronic devices to attack, cripple or damage information systems held by governmental or private institutions, as well as individual citizens.
- **Civil Disturbance**  
Civil disturbances can occur due to socio-economic, political or other reasons. These types of events typically occur in public places, including court houses or town civic spaces.
- **Coastal Oil Spill**  
While oil spills would primarily affect the Gulf coast of Florida, oil spills can negatively affect tourism and ecological conditions on the Atlantic coast of Florida.
- **Terrorism**  
Terrorism includes any attempt to attack, cripple or damage public goods, public infrastructure or citizens on a large scale.
- **Mass Migration**  
Mass-migration occurs when persons of one geographic area move in large numbers to another geographic location.
- **HazMat**  
Hazardous material (HazMat) includes events when liquid, solid or gaseous chemicals that are harmful or fatal to humans or ecological infrastructure disperse into the atmosphere.
- **Agro-Terrorism**  
Agro-Terrorism includes any attempt to maliciously destroy or harm the agricultural industry, the secondary effects of which can be disease, famine and massive economic loss.
- **Public Health Emergencies**  
Public health emergencies include medical surges (often from mass casualty events) that require hospitals to act beyond normal capacity. Pandemics are included in this category.

## 5.16 CONCLUSIONS ON HAZARD RISK

The hazard profiles presented in this section were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its “How-to” guidance document titled *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA Publication 386-2). It relies heavily on historical and anecdotal data, stakeholder input, and professional and experienced judgment regarding observed and/or anticipated hazard impacts. It also carefully considers the findings in other relevant plans, studies and technical reports.

### 5.16.1 Hazard Risk Scoring

In order to provide a comprehensive assessment of each hazard in each jurisdiction, the hazards were scored based on a number of vulnerability factors including area impacted, health and safety of the population, property, environment, and economic vulnerability. Each of these factors has been assigned a number between one and five, based on risk, with five being the greatest. The values then were summed and multiplied by the probability of occurrence factor, which is also a 1 to 5 scale. The resulting value is a risk rating for each hazard within a specific jurisdiction. Each participating jurisdiction updated their hazards scores in June and July of 2009, based on the initial scores that were provided during the 2004 LMS update. **Table 5.19** provides the top three hazard vulnerabilities for each participating jurisdiction within Volusia County. A complete list of hazards for each jurisdiction as well as the score for each hazard and vulnerability factor can be found in **Appendix F**. Further, the Vulnerability Assessment (Section 6) also provides information on hazard vulnerability at the jurisdictional level.

**TABLE 5.19: Snapshot of Hazard Risk Ranking**

	Hazard Risk Ranking		
	First	Second	Third
<b>Daytona Beach</b>	High Winds	Hail	Storm Surge, Tsunami
<b>Daytona Beach Shores</b>	All Natural Hazards	Flooding	Storm Surge, Tsunami
<b>DeBary</b>	Flooding	High Winds	Lightning
<b>DeLand</b>	High Wind	Hail	Severe Winter Storm
<b>Deltona</b>	Lightning	Severe Winter Storm	Drought
<b>Edgewater</b>	Thunderstorm	Severe Winter Storm	Drought
<b>Holly Hill</b>	High Winds	All Natural Hazards	Lightning
<b>Lake Helen</b>	High Winds	Flooding	Drought
<b>New Smyrna Beach</b>	High Winds	Flood	Storm Surge
<b>Oak Hill</b>	Flooding	Flooding	Wildfire
<b>Orange City</b>	Lightning	High Winds	Drought
<b>Ormond Beach</b>	High Winds	Flooding	Storm Surge
<b>Pierson</b>	Wildfire	Wind	Drought

## SECTION 5: HAZARD PROFILES

**TABLE 5.19: Snapshot of Hazard Risk Ranking**

	Hazard Risk Ranking		
	First	Second	Third
<b>Ponce Inlet</b>	High Winds	Storm Surge/Tsunami	Flooding
<b>Port Orange</b>	High Winds	Lightning	Severe Winter Storm
<b>South Daytona</b>	Flooding	Storm Surge, Tsunami	All Natural Hazards
<b>Unincorporated</b>	High Winds	Flooding	Wildfire

### 5.16.2 Final Determinations

The conclusions drawn from the hazard profiling process for Volusia County resulted in the classification of risk for each identified hazard according to three categories: High, Moderate and Low Risk (**Table 5.20**). For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout all of Volusia County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in the *Vulnerability Assessment* section. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or unprecedented magnitudes is still possible in some cases and their assigned classification will continue to be evaluated during future plan updates.

**TABLE 5.20: Conclusions on Hazard Risk for Volusia County (Natural Hazards)**

<b>HIGH RISK</b>	Flooding Hurricane and Tropical Storm (High Winds) Lightning Tornado Wildfire Drought
<b>MODERATE RISK</b>	Erosion Hail Storm Surge Thunderstorm
<b>LOW RISK</b>	Severe Winter Storm Sinkhole Tsunami

## SECTION 6 – VULNERABILITY ASSESSMENT

### 44 CFR Requirement

**44 CFR Part 201.6(c)(2)(ii):** The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. The description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

### 6.1 OVERVIEW

This section builds upon the information provided in Section 5: *Hazard Profiles* by identifying and characterizing an inventory of assets in Volusia County, and then assessing the potential impact and amount of damages that can be expected to be caused by each identified hazard event. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard. In so doing, Volusia County and its participating jurisdictions and partners may better understand their unique risks to identified hazards and be better prepared to evaluate and prioritize specific hazard mitigation actions.

This section begins with an explanation of the methodology applied to complete the hazard vulnerability assessment, followed by a summary description of the asset inventory as compiled for Volusia County. The remainder of this section focuses on the results of the vulnerability assessment, and is organized by hazard as listed below.

- ▶ **Atmospheric**
  - Hail
  - Hurricane and Tropical Storm
  - Lightning
  - Severe Winter Storm
  - Thunderstorm
  - Tornado
  
- ▶ **Hydrologic**
  - Coastal Erosion
  - Drought
  - Flood
  - Storm Surge
  
- ▶ **Geologic**
  - Sinkhole

- Tsunami
  
- ▶ **Other**
  - Wildfire
  - Sea Level Rise

### 6.2 ASSESSMENT METHODOLOGY

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This vulnerability assessment was conducted utilizing two distinct methodologies: (1) a Geographic Information System (GIS)-based analysis; and (2) applying a statistical risk assessment approach. Each approach provides estimates for the potential impact of hazards by using a common, systematic framework for evaluation, including historical occurrence information. The results of the vulnerability assessment are provided for each hazard listed above.

A GIS-based analysis was conducted for seven hazards:

- Hurricane and Tropical Storm
- Riverine Flood
- Coastal Flood (Storm Surge)
- Coastal Erosion
- Tsunami
- Sinkhole
- Wildfire

A statistical risk assessment approach was used to analyze six hazards:

- Hail
- Thunderstorm
- Lightning
- Tornado
- Severe Winter Storm
- Drought

### 6.2 GIS-Based Analysis

For the GIS-based assessment, digital data was collected from local, state and national sources. ESRI® ArcGIS™ 10.2 was used to assess risk utilizing digital data including local tax records for individual parcels and georeferenced point locations for critical facilities. Using these data layers, risk was assessed by estimating the assessed building value associated with parcels determined to be located in identified hazard areas. HAZUS-MH was also used to model hurricane force winds and estimate potential losses. To estimate population in hazard areas, Census 2010 population data by census block was obtained from HAZUS-MH and census blocks intersecting with hazard areas were used to determine exposed population counts.

Census 2010 was used for analyses as it is available by census block. There are other population estimates that are provided by reputable sources; however, they are only available at the jurisdiction level (e.g., county or city). Jurisdictional level population estimates cannot be used to accurately conduct GIS analyses to determine how much of the county and its population is exposed to various hazards

## SECTION 6: VULNERABILITY ASSESSMENT

based on geographic location (i.e., census block or tract level). When the next decennial census population data is available the county will consider reassessing the populations that are vulnerable to various hazards.

The objective of the GIS-based analysis was to determine the estimated vulnerability of people, buildings and critical facilities to the identified hazards for Volusia County using best available geospatial data. In so doing, local databases made available through Volusia County such as local tax assessor records, parcel boundaries and critical facilities data were used in combination with digital hazard data. The results of the analysis provided an estimated number of people, as well as the numbers and values of buildings and critical facilities determined to be potentially at risk to those hazards with delineable geographic hazard boundaries. These hazards included flood, storm surge, dam failure, wildfire and technological hazards. A more specific description of the GIS-based analysis for each particular hazard is provided under the vulnerability assessment section of each respective hazard.

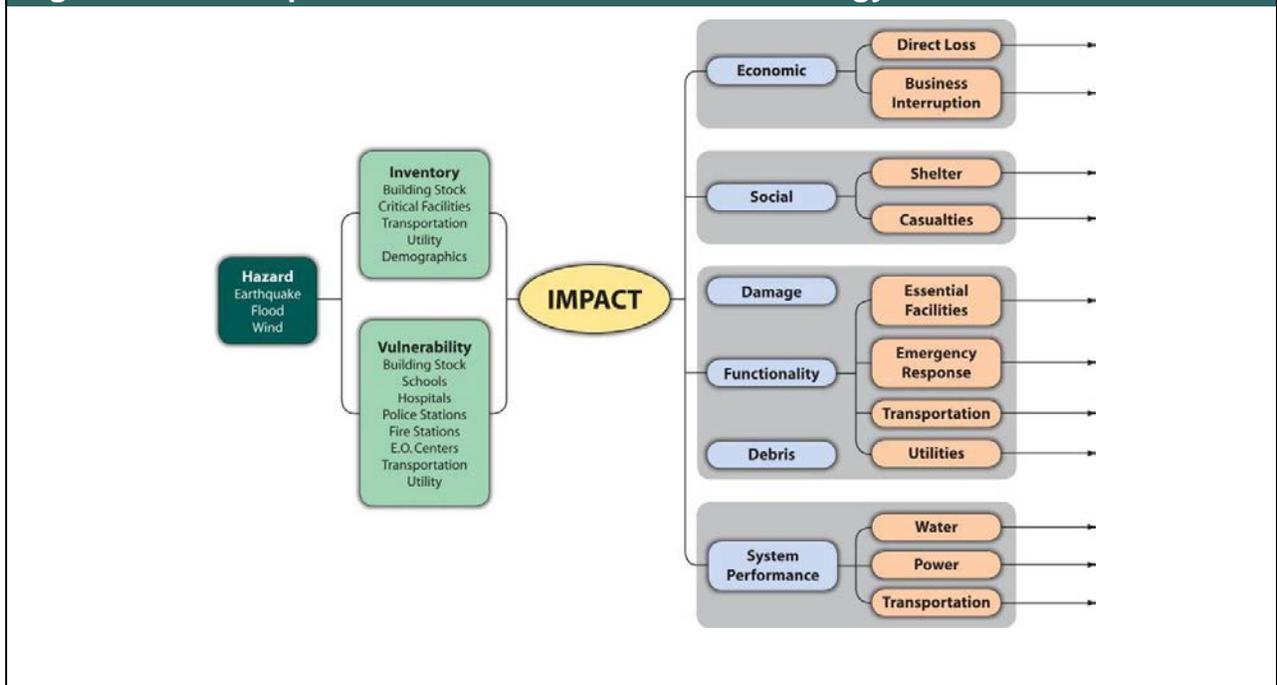
### HAZUS-MH

HAZUS-MH is FEMA's standardized loss estimation software program built upon an integrated GIS platform (**Figure 6.1**) to conduct analysis at a regional level (i.e., not on a structure-by-structure basis). The HAZUS-MH risk assessment methodology is parametric, in that distinct hazard and inventory parameters (e.g., wind speed and building types) were modeled using the HAZUS-MH software to determine the impact (i.e., damages and losses) on the built environment. This risk assessment applied HAZUS-MH to produce countywide profiles and estimate losses for three hazards at the jurisdictional level. At the time this analysis was completed, HAZUS-MH



MR-3 (September 2007) was used to estimate potential losses from hurricane winds, coastal flood, and earthquake using HAZUS-MH default building stock inventory data. The results of the HAZUS-MH model analysis include annualized loss estimates for each participating jurisdiction in Volusia County so that potential loss values may be compared to one another throughout Volusia County. In generating loss estimates through HAZUS-MH, some data normalization was necessary to account for recognized differences between actual assessed building values as provided by Volusia County and estimated replacement building value data as provided within HAZUS-MH. In order to account for the difference between modeled and actual values, the ratio of estimated losses produced by HAZUS-MH as compared to total HAZUS-MH building inventory was used to estimate percent damage. The percent damage ratio was then applied to the local assessed values of each jurisdiction to estimate potential losses and loss ratios in Volusia County for this analysis.

Figure 6.1: Conceptual Model of HAZUS-MH Methodology



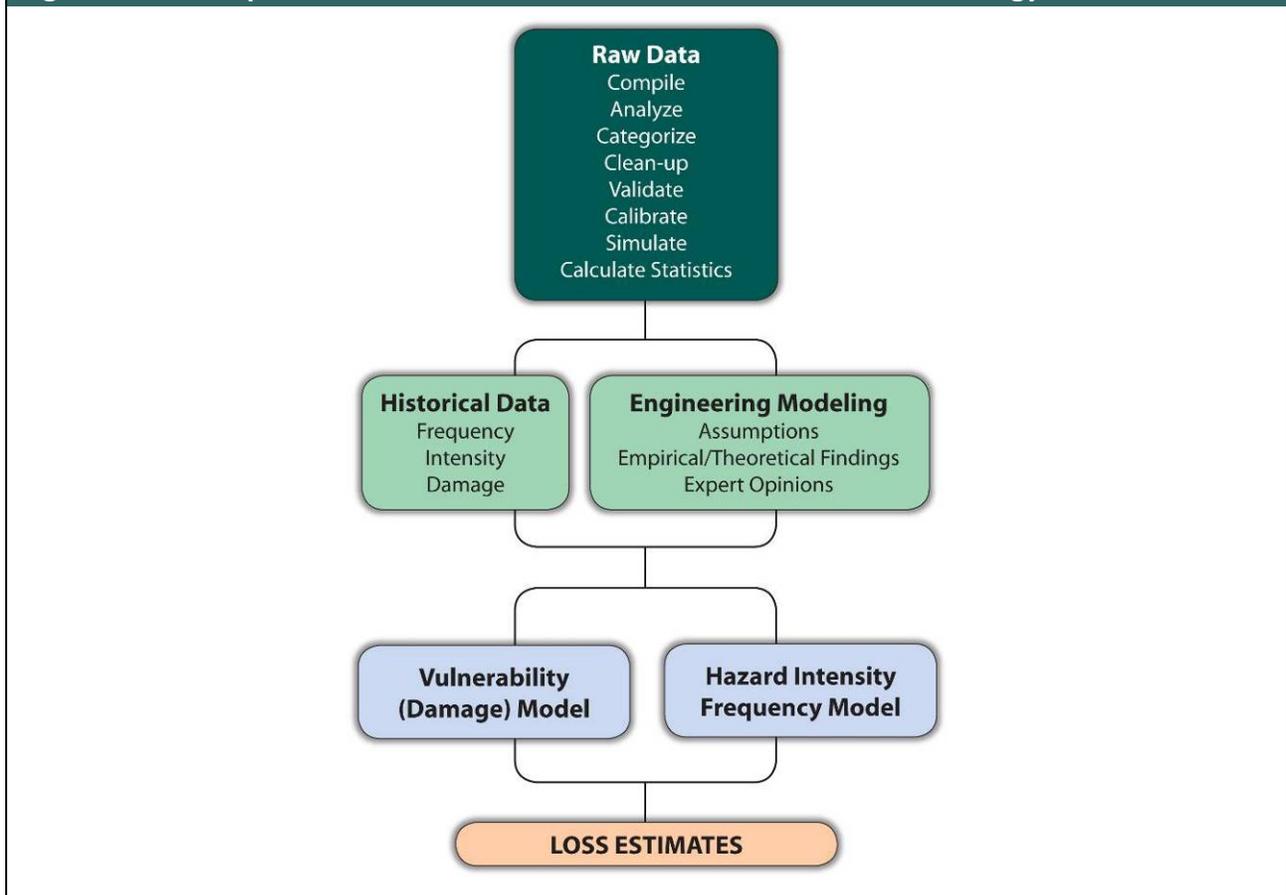
### 6.3 Statistical Risk Assessment Methodology

The statistical risk assessment approach was applied to analyze hazards of concern that were outside the scope of HAZUS-MH and the GIS-based risk assessment. This methodology uses a statistical approach and mathematical modeling of risk to predict a hazard's frequency of occurrence and estimated impacts based on recorded or historic damage information. This methodology was used to assess risk to the extreme temperatures, hail, tornado, winter storm and drought hazards. Available historical data for each hazard was used and statistical evaluations were performed. The general steps used in the statistical risk assessment methodology are summarized below:

1. Compile data from local, state and national sources, as well as literature;
2. Clean up data, including removal of duplicate records and update losses to account for inflation;
3. Identify patterns in frequency, intensity, vulnerability and loss
4. Statistically and probabilistically extrapolate the patterns; and
5. Produce meaningful results, including the development of annualized loss estimates.

**Figure 6.2** illustrates a conceptual model of the statistical risk assessment methodology as applied to the Volusia County area.

Figure 6.2: Conceptual Model of the Statistical Risk Assessment Methodology



The vulnerability assessment findings are presented in terms of potential annualized losses, wherever possible. In general, presenting results in the annualized form is useful in three ways:

1. This approach accounts for the contribution of potential losses from all future disasters;
2. Annualized results for different hazards are readily comparable, thus easier to rank; and
3. The use of annualized losses is the most objective approach for evaluating mitigation alternatives.

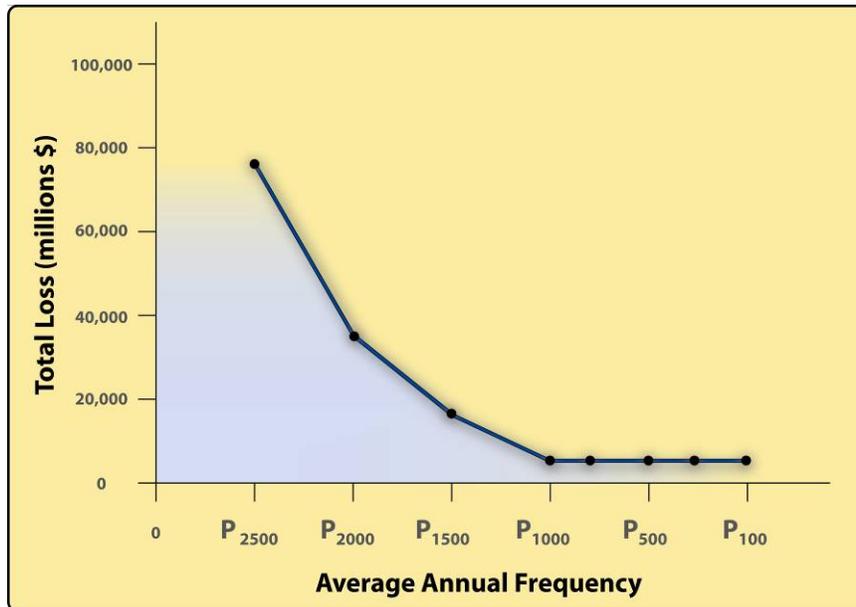
Annualized losses for the hazards where the parametric approach was utilized were computed in a three-step process:

1. Compute/estimate losses for a number of scenario events with different return periods [e.g., 10-year, 100-year, 200-year, 500-year, etc.];
2. Approximate the Probability versus Loss Curve through curve fitting; and
3. Calculate the area under the fitted curve to obtain annualized losses.

## SECTION 6: VULNERABILITY ASSESSMENT

This approach is illustrated graphically in **Figure 6.3**. For other hazards where the statistical approach was used, the computations are based primarily on the observed historical losses.

**Figure 6.3: Graphical Representation of the Annualized Loss Methodology**



The economic loss results are presented here using two interrelated risk indicators: Annualized Loss and Annualized Loss Ratio. The Annualized Loss is the estimated long-term weighted average value of losses to property in any single year in a specified geographic area (i.e., municipal jurisdiction). The Annualized Loss Ratio expresses estimated annualized loss normalized by assessed building value.

The estimated Annualized Loss (AL) addresses the key idea of risk: the probability of the loss occurring in the study area (largely a function of building construction type and quality). By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk. The Annualized Loss Ratio (ALR) represents the AL as a fraction of the assessed value of the local inventory. This ratio is calculated using the following formula:

$$\text{ALR} = \text{Annualized Losses} / \text{Total Exposure}$$

The ALR gauges the relationship between average annualized loss and assessed values. This ratio can be used as a measure of vulnerability in the areas and since it is normalized by assessed value, it can be directly compared across different geographic units such as metropolitan areas, counties or municipalities.

Loss estimates provided in this vulnerability assessment are based on best available data, and the methodologies applied result in an approximation of risk. These estimates should be used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss estimation

methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, demographics or economic parameters).

Findings for each hazard are detailed in the hazard-by-hazard vulnerability assessment that follows.

### 6.3 ASSET INVENTORY

An inventory of Volusia County's georeferenced assets was created in order to identify and characterize those properties potentially at risk to the identified hazards. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Three categories of assets were created and assessed through GIS analysis, including:

1. Improved Property: Includes all improved properties in unincorporated areas according to local parcel data provided by Volusia County. The information has been expressed in terms of the number of parcels, number of buildings, and total assessed value of improvements (buildings and accessory structures) that may be exposed to the identified hazards.
2. Critical Facilities: Includes Volusia County's emergency operations centers, fire stations, police stations, schools and hospitals.
3. Critical Infrastructure: Includes primary roads and active railroads.

#### Improved Property

**Table 6.1** lists the number of parcels with improved property (i.e., structures) and the total assessed value of improvements<sup>1</sup> for unincorporated Volusia County and the incorporated areas (study area of vulnerability assessment). The study area is depicted in **Figure 6.4**. The population by census block has been illustrated in lieu of the parcels, which would not be meaningful at the countywide scale map. The population by census block is illustrated to show where populations are concentrated in the study region. According to the U.S. Census American Community Survey (2005-2006), there were 2.39 people per household. There were 2.32 people per household according to the U.S. Census 2010 population county.

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<sup>1</sup> Total assessed values for improvements is based on 2014 Volusia County tax assessor records.

## SECTION 6: VULNERABILITY ASSESSMENT

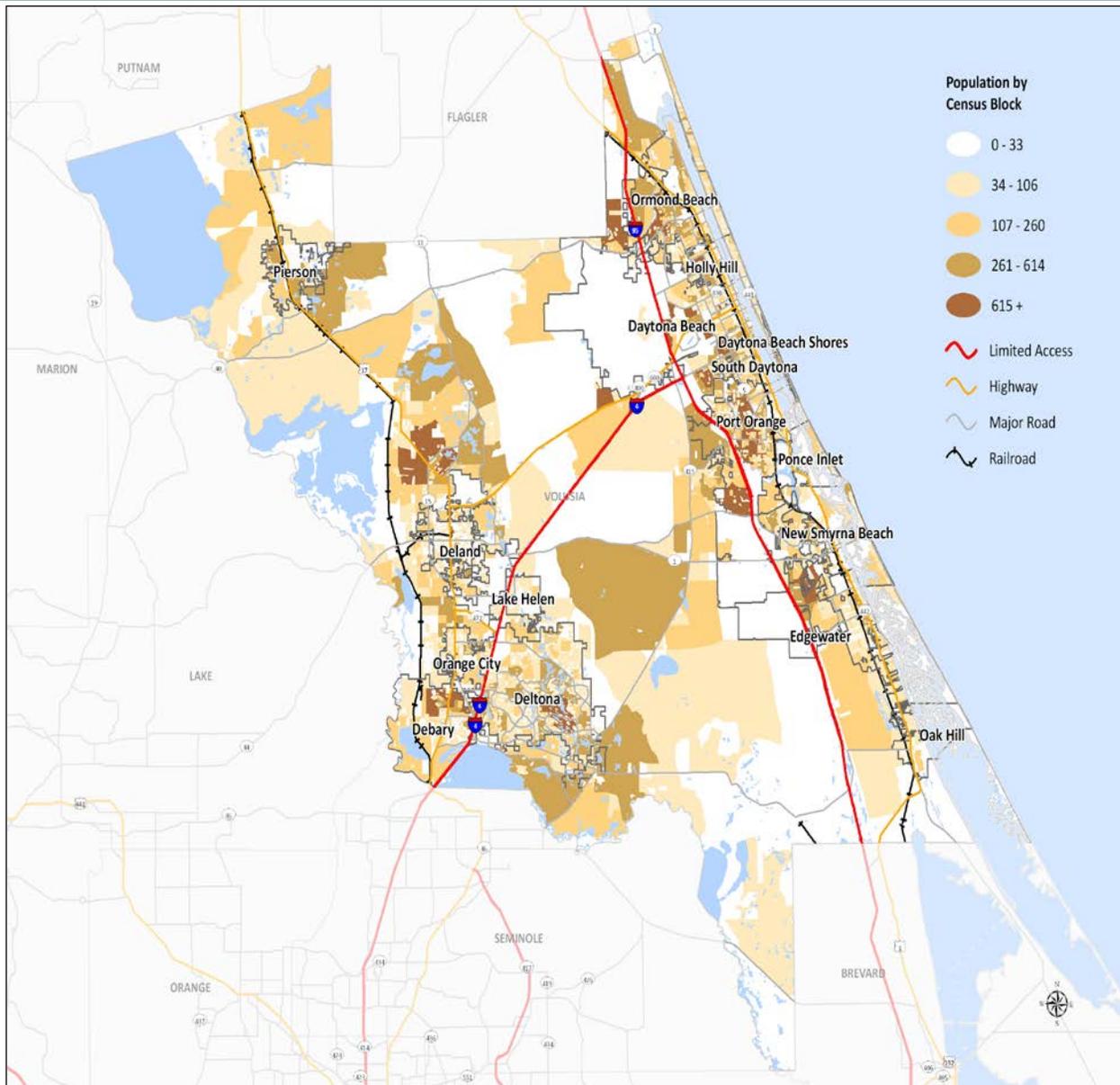
**TABLE 6.1: Volusia County Improved Property**

JURISDICTION	TOTAL ESTIMATED NUMBER OF IMPROVED PARCELS	TOTAL IMPROVED VALUE OF PARCELS
Daytona Beach	18,756	3,113,758,732
Daytona B. Shores	536	108,379,184
DeBary	8,360	855,016,726
De Land	8,579	1,379,957,569
Deltona	33,225	2,642,766,558
Edgewater	9,355	806,296,779
Holly Hill	4,538	432,668,504
Lake Helen	1,099	92,912,745
New Smyrna Beach	11,073	1,436,053,516
Oak Hill	888	67,557,864
Orange City	2,665	446,136,500
Ormond Beach	15,531	2,269,411,643
Pierson	590	49,333,302
Ponce Inlet	1,102	169,838,467
Port Orange	20,423	2,469,426,353
South Daytona	4,554	482,748,537
Unincorporated	45,780	4,680,525,914
<b>TOTAL</b>	<b>187,054</b>	<b>\$21,502,788,893</b>

Source: Volusia County GIS Department

## SECTION 6: VULNERABILITY ASSESSMENT

**FIGURE 6.4: Volusia County LMS Study Region with Population by Census Block**



Source: 2010 U.S. Census

## SECTION 6: VULNERABILITY ASSESSMENT

### Critical Facilities

**Table 6.2** lists Volusia County’s critical facilities, as identified by each jurisdiction in Volusia County.

A full listing of the critical facilities and their exposure to each hazard included in this vulnerability assessment is located in **Appendix E**. This information is not available for public distribution as it contains sensitive information. The critical facilities data is on file with Volusia County Emergency Management.

Please note that the numbers within this critical facility listing do not include lift stations, wastewater facilities or sewage treatment facilities. Information on those facilities can be found within the 2013 Volusia County Floodplain Management Plan, within Appendix A, by jurisdiction.

<b>TABLE 6.2: Volusia County “Core” Critical Facilities</b>	
<b>JURISDICTION</b>	<b>Number</b>
Daytona Beach	214
Daytona Beach Shores	6
DeBary	14
DeLand	174
Deltona	83
Edgewater	10
Holly Hill	47
Lake Helen	6
New Smyrna Beach	21
Oak Hill	6
Orange City	31
Ormond Beach	49
Pierson	6
Ponce Inlet	3
Port Orange	152
South Daytona	31
Unincorporated	76
<b>TOTAL</b>	<b>922</b>

Source: Volusia County GIS Department

*Note: These numbers do not reflect certain types of critical facilities that are additionally listed in the Critical Facility Appendix within this report. Please reference that listing for more information. These numbers only reflect the number of “core” facilities, not including water and sewage treatment plants or state flood facilities.*

*Specifically, this table identifies 922 out of a total of 1125 total critical facilities identified.*

## SECTION 6: VULNERABILITY ASSESSMENT

### Infrastructure and Lifelines

Table 6.3 lists Volusia County's primary roads and railroads.

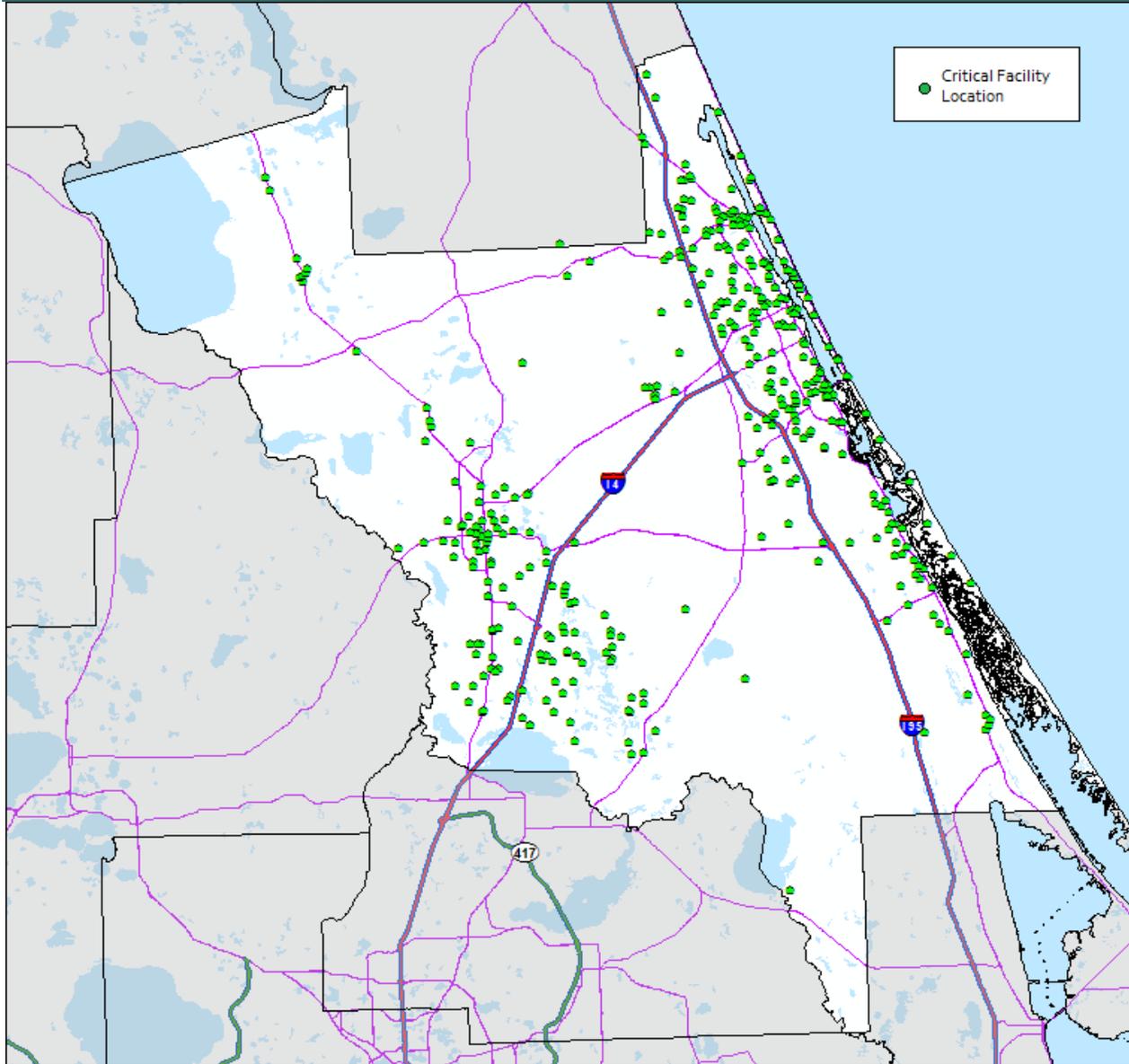
<b>TABLE 6.3: Infrastructure</b>			
<b>JURISDICTION</b>	<b>Limited Access (mi)*</b>	<b>Highway (mi)*</b>	<b>Railroad (mi)**</b>
Daytona Beach	5.02	8.66	3.56
Daytona Beach Shores	-	-	-
DeBary	0.22	5.35	6.87
DeLand	-	7.64	1.18
Deltona	6.28	0.02	-
Edgewater	2.20	7.32	5.41
Holly Hill	-	2.73	2.56
Lake Helen	1.10	-	-
New Smyrna Beach	-	6.30	6.69
Oak Hill	-	2.88	1.93
Orange City	-	4.27	-
Ormond Beach	3.41	5.02	7.89
Pierson	-	3.21	4.03
Ponce Inlet	-	0.27	-
Port Orange	10.61	3.40	4.94
South Daytona	-	2.51	2.36
Unincorporated	62.53	50.84	51.05
<b>TOTAL</b>	<b>91.36</b>	<b>110.42</b>	<b>98.48</b>

Source: Volusia County GIS Department

## SECTION 6: VULNERABILITY ASSESSMENT

**Figure 6.5** illustrates the general locations of the critical facilities and infrastructure according to currently georeferenced point and line locations.

**FIGURE 6.5: Volusia County Critical Facilities**



Source: Volusia County GIS, ECFRPC

## 6.4 HAIL

As it cannot be predicted where hail may fall, all existing and future buildings, facilities and populations in Volusia County are considered to be equally exposed to this hazard and could potentially be impacted. When hail impacts Volusia County and all municipalities, populations are vulnerable to the consequences of damage from hail. Hail can become as big as baseballs or golf balls, damaging structures such as car windows, emergency vehicles, exposed persons and communication systems, but is typically the size of pennies or quarters in Florida. Hail storms can last for a few minutes to hours. It is important to note that only reported hail events have been factored into this vulnerability assessment<sup>2</sup>. If hail strikes a human being it can cause personal injury.

To estimate losses due to hail, the National Climatic Data Center (NCDC) historical hail event loss data for occurrences in the county were used to develop a hail stochastic model. In this model:

- Losses were scaled for inflation;
- Average historic hail damageability was used to generate losses for historical hail events where losses were not reported;
- Expected annualized losses were calculated through a non-linear regression of historical data; and
- Probabilistic losses were scaled to account for would-be losses where no exposure/instrument was present at the time of the event.

**Table 6.4** shows total exposure and potential annualized property losses and annualized percent loss ratios resulting from hail for Volusia County. While all of Volusia County’s inventoried assets are equally exposed to hail, any anticipated future damages or losses are expected to be minimal. The graph below describes the common reference names to different sizes of hail. Florida typically experiences pea to half-dollar sized hail.

**FIGURE 6.6: Hail Typology**

Appearance	Approximate Size in Inches
Pea	0.25 - 0.50 inch
Penny	0.75 inch
Nickel	0.88 inch
Quarter	1.00 inch
Half Dollar	1.25 inch
Walnut/Ping Pong	1.50 inch
Golf ball	1.75 inch
Hen Egg	2.00 inch
Tennis Ball	2.50 inch
Baseball	2.75 inch
Tea Cup	3.00 inch
Grapefruit	4.00 inch
Softball	4.50 inch

<sup>2</sup>Source: National Climatic Data Center (2014)

It is possible that additional hail events may have occurred since 1950 that were not reported to NCDC and are not accounted for in this analysis.

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.4: Total Exposure and Potential Annualized Losses from Hail**

JURISDICTION	EXPOSURE (TOTAL IMPROVED VALUE OF PARCELS)	ANNUALIZED LOSSES	ANNUALIZED PERCENT LOSS RATIO
Daytona Beach	3,113,758,732	2,489	0.000%
Daytona B. Shores	108,379,184	0	0.000%
DeBary	855,016,726	0	0.000%
DeLand	1,379,957,569	0	0.000%
Deltona	2,642,766,558	0	0.000%
Edgewater	806,296,779	1,295	0.000%
Holly Hill	432,668,504	0	0.000%
Lake Helen	92,912,745	0	0.000%
New Smyrna Beach	1,436,053,516	0	0.000%
Oak Hill	67,557,864	0	0.000%
Orange City	446,136,500	0	0.000%
Ormond Beach	2,269,411,643	0	0.000%
Pierson	49,333,302	0	0.000%
Ponce Inlet	169,838,467	0	0.000%
Port Orange	2,469,426,353	67	0.000%
South Daytona	482,748,537	0	0.000%
Unincorporated	4,680,525,914	0	0.000%
<b>TOTAL</b>	<b>\$21,502,788,893</b>	<b>\$3,851</b>	0.000%

Source: National Climatic Data Center and Volusia County GIS Department

### **Additional Impacts of Hail on Structures and Property**

While hail can have effects on populations and can cause injury, hail also has the ability to damage structures. Vulnerable areas of structures include pool screens, windows, and exposed pieces of personal property that are exposed to environmental conditions, such as outdoor décor or automobiles. The size of hail has a direct impact on the scope of the damage that it can incur on a structure. For example, golf ball sized hail (as depicted in Figure 6.6) can completely destroy exposed glass structures, while pea-to-penny-sized hail would have a far lower ability to incur such damage.

There are no specific areas of the county that are at a higher risk to property damage as a result of hail from a geographic perspective. In situations where tornadoes are present, hail may have a higher likelihood of being present. Moreover, structures that have partial or full tree coverage could have lessened property damage due to hail as a result of the slowing speed of the hail before impact with personal property.

## SECTION 6: VULNERABILITY ASSESSMENT

### 6.5 HURRICANE AND TROPICAL STORM

Since hurricanes and tropical storms often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. All populations may be impacted by these events, but those at the highest risk include the homeless, disabled, elderly and lower income populations. Any persons living on the barrier islands or adjacent to the Intracoastal Waterway system may also be disproportionately impacted. Critical infrastructure such as communication systems and power sources are vulnerable to this event. Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, coastal erosion, high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects.

The current HAZUS-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes. Therefore only hurricane winds are analyzed in this section. Vulnerability to storm surge resulting from hurricanes is addressed individually in a separate section. A probabilistic scenario was created using HAZUS-MH to assess the vulnerability of Volusia County to hurricane winds. Default HAZUS-MH wind speed data and damage functions were used to determine the annual expected loss at the census tract level. **Table 6.5** shows estimated exposure, potential annualized losses for residential and commercial buildings and the annualized percent loss ratio for each jurisdiction in Volusia County. **Table 6.6** corresponds with **Figure 6.6** and depicts 2014 parcel exposure to wind hazard zones.

**TABLE 6.5: Total Exposure and Potential Annualized Losses from Hurricane Wind and Tropical Storm**

JURISDICTION	Exposure (Total Improved Value Of Parcels)	Residential Building Losses	Commercial Building Losses	Total Annualized Expected Property Losses	Annualized Percent Loss Ratio
Daytona Beach	3,113,758,732	5,220,580	954,257	10,229,498	0.33%
Daytona B. Shores	108,379,184	1,416,333	79,257	2,235,170	2.06%
DeBary	855,016,726	669,760	58,154	1,067,971	0.12%
DeLand	1,379,957,569	1,469,217	350,353	3,127,843	0.23%
Deltona	2,642,766,558	3,652,951	273,600	5,809,187	0.22%
Edgewater	806,296,779	1,299,162	141,814	2,226,736	0.28%
Holly Hill	432,668,504	829,030	180,478	1,802,272	0.42%
Lake Helen	92,912,745	163,939	16,114	285,682	0.31%
New Smyrna Beach	1,436,053,516	3,901,394	524,844	7,210,537	0.50%
Oak Hill	67,557,864	149,372	17,773	275,639	0.41%
Orange City	446,136,500	628,160	147,780	1,222,528	0.27%
Ormond Beach	2,269,411,643	3,207,270	540,132	6,031,426	0.27%
Pierson	49,333,302	127,939	14,908	225,221	0.46%
Ponce Inlet	169,838,467	636,115	46,389	1,017,749	0.60%
Port Orange	2,469,426,353	3,653,346	414,496	6,286,779	0.25%
South Daytona	482,748,537	1,037,500	211,961	1,993,339	0.41%
Unincorporated	4,680,525,914	5,027,147	470,767	8,416,476	0.18%
<b>Total</b>	<b>\$21,502,788,893</b>	<b>\$33,089,213</b>	<b>\$4,443,077</b>	<b>\$59,464,050</b>	<b>N/A</b>

Source: HAZUS-MH, 2010 U.S. Census and Parcel Data (2014 Parcel Analysis on Following Page)

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.6: 2014 Parcel Exposure to Wind Hazard Zones**

Financial Exposure to Hazard Zones – Cumulative Financial Values within Zones						
Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
91-95 mph	477 0.0%	30 6.3% built	\$4,318,137	\$161,512	\$3,820,604	\$534,396
96-100 mph	272,177 56.8%	144,789 53.2% built	\$3,719,331,882	\$8,992,343,281	\$12,356,393,046	\$9,291,190,243
101-105 mph	206,889 43.2%	148,142 71.6% built	\$6,590,903,525	\$10,315,347,682	\$16,537,581,390	\$13,029,532,696

Build-Year Summary of Built Parcels within Hazard Zones – Build Year Breakdown by Hazard Zone						
Hazard Zone	Built Parcels	Built Pre-1970	Built 1970-1979	Built 1980-1989	Built 1990-1999	Built 2000-2014
91-95 mph	30	12 40.0% of built	7 23.3% of built	0 0.0% of built	3 10.0% of built	8 26.7% of built
96-100 mph	144,789	32,491 22.4% of built	20,343 14.1% of built	35,382 24.4% of built	23,709 16.4% of built	34,179 23.6% of built
101-105 mph	148,142	52,530 35.5% of built	24,220 16.3% of built	32,864 22.2% of built	17,750 12.0% of built	20,778 14.0% of built

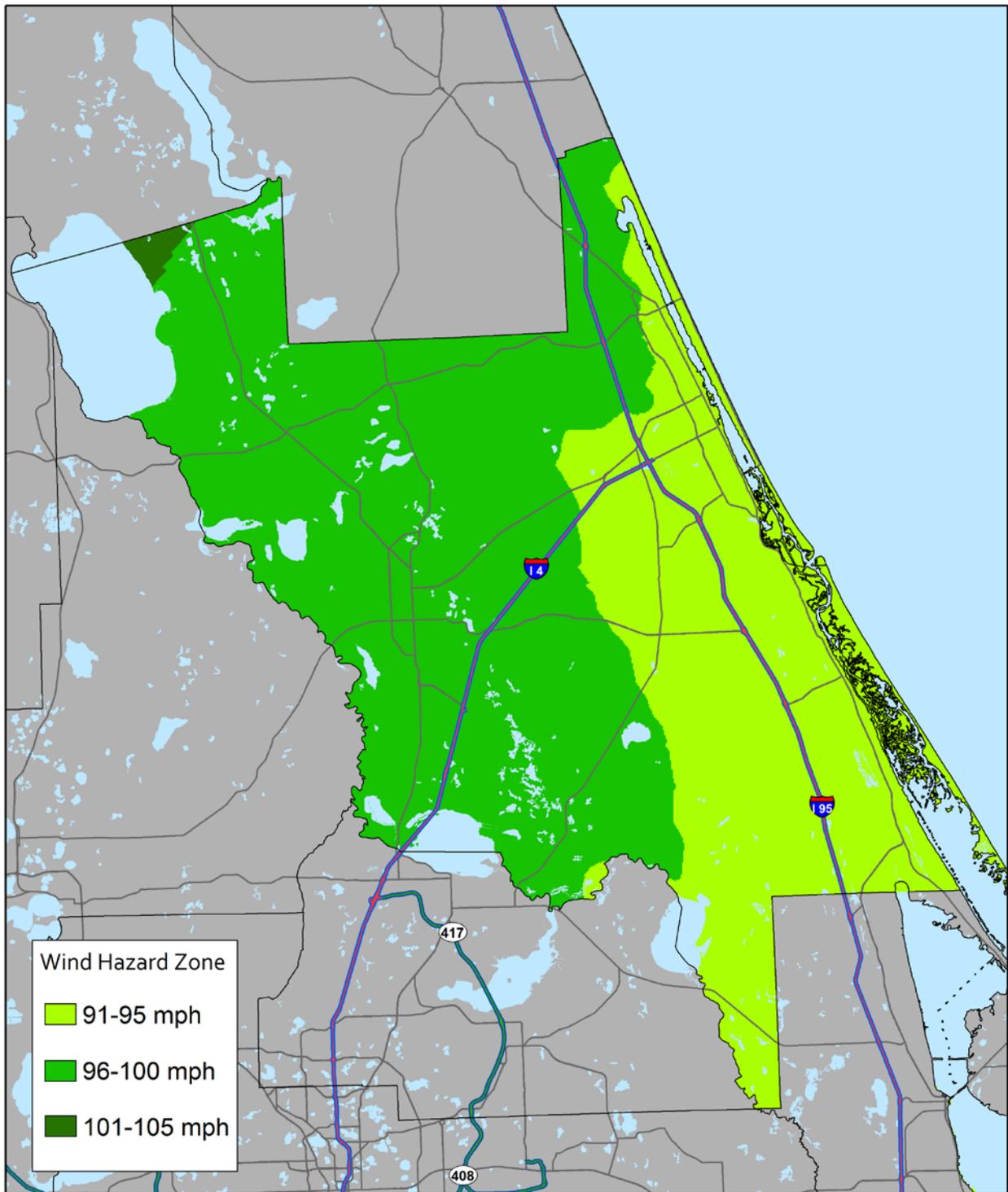
Land Use Summary of Parcels within Hazard Zones – Number of Parcels per Land Use and Hazard Zone						
Hazard Zone	Low Density Residential	Med/Hi. Density Residential	Commercial and Office	Industrial	Institutional	Agricultural
91-95 mph	69	0	0	0	361	47
96-100 mph	194,508	4,996	14,246	4,075	20,772	24,216
101-105 mph	146,762	8,419	16,931	3,392	14,750	11,944

Source: HAZUS-MH, Volusia County GIS (2014)

### Qualitative Assessment of Wind Hazard Zone Vulnerability

Table 6.6 (above) and Figure 7 on the following page depict the likely wind speeds that would be experienced within Volusia County during a hurricane situation. The model utilized takes the average tropical storm that is likely to hit Florida based off of historical data, which places Volusia County in a lower risk zone as compared to areas of the state such as the western panhandle and southeastern Florida. As depicted in the map on the following page, areas of the county that are at highest risk for wind damage are those within close proximity to the Atlantic Ocean or areas closest to the southeastern portion of the county. 56.8% of parcels within the county are located within the 96-100 mile per hour hazard zone, representing the largest portion of parcels, while 43.2% of parcels in the county are located within the 101-105 mile per hour zone. 53.2% and 71.6% of the parcels within these zones, respectively, have built structures present. The build year of these parcels are fairly evenly distributed. However, 35.5% of the parcels within the 101-105 mile per hour zone were built before 1970, which could indicate that these buildings are at a higher risk for property damage. Of the 406 core critical facilities identified within this report, 216 (53.2%) are located within the highest risk zone of the county. Please reference Appendix E for an entire listing of critical facilities and their corresponding wind hazard zones.

FIGURE 6.7: Wind Hazard Zones



Source: HAZUS-MH

## 6.6 LIGHTNING

As it cannot be predicted where lightning may strike, all existing and future buildings, facilities and populations in Volusia County are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported lightning strikes have been factored into this vulnerability assessment<sup>3</sup>.

To estimate losses due to lightning, NCDC historical lightning loss data for occurrences in the County were used to develop a lightning stochastic model. In this model:

- Losses were scaled for inflation;
- Average historic lightning damageability was used to generate losses for historical lightning events where losses were not reported;
- Expected annualized losses were calculated through a non-linear regression of historical data; and
- Probabilistic losses were scaled to account for would-be losses where no exposure/instrument was present at the time of the event.

**Table 6.7** shows total exposure and potential annualized property losses and percent loss ratios resulting from the lightning hazard for Volusia County. Based on local knowledge, emergency managers in Volusia County are aware that approximately 4,000 lightning strikes occur each week during summer afternoon thunderstorms. Although, the annualized losses from lightning in Volusia County are low, the probability and frequency are high. Therefore, it is anticipated that lightning will continue to threaten life and pose property damage throughout the county.

Lightning is a dangerous threat to people in the United States, particularly those who are outside during the summer. The number one area for fatalities due to lightning strikes is open fields, making Volusia County's 47 miles of Atlantic Ocean beach among the most dangerous in the County. This heightens the risk for the tourist population who may be unaware of the imminent danger of quickly approaching tropical systems that emit lightning. This was true in July 2014 during the Coke Zero 400, when hundreds of thousands of tourists were outside and exposed with no coverage for lightning. Communication systems and power sources are among the most vulnerable land uses to this hazard due to their electrical nature. Volusia County has 30 golf courses, along with private and public recreational facilities, the Daytona Beach International Speedway and 2 additional smaller outdoor race tracks, 2 intracoastal waterways traversing the county, school facilities, and parks located throughout the County. Individuals participating in the following recreational activities could be vulnerable to lightning including: golf, football, baseball, soccer, surfing, horseback riding, walking, jogging, tennis, boating, fishing, kite flying, kayaking, paddle boarding, beach activities, picnicking, camping, hiking, gardening, hunting, swimming, basketball, softball, cycling, wind surfing, lacrosse, archery, track and field events, stock car races, outdoor festivals and numerous other outdoor activities. It is estimated that at least 75% of the population participates in at least one of these recreational activities, and is thus vulnerable to lightning.

<sup>3</sup> It is possible that additional lightning strikes may have occurred since 1950 that were not reported to NCDC and are not accounted for in this analysis.

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.7: Total Exposure and Potential Annualized Losses from Lightning**

JURISDICTION	EXPOSURE (TOTAL IMPROVED VALUE OF PARCELS)	ANNUALIZED LOSSES	ANNUALIZED PERCENT LOSS RATIO
Daytona Beach	3,113,758,732	410	0.000%
Daytona Beach Shores	108,379,184	0	0.000%
DeBary	855,016,726	4,834	0.000%
DeLand	1,379,957,569	0	0.000%
Deltona	2,642,766,558	5,417	0.000%
Edgewater	806,296,779	307	0.000%
Holly Hill	432,668,504	0	0.000%
Lake Helen	92,912,745	0	0.000%
New Smyrna Beach	1,436,053,516	1,735	0.000%
Oak Hill	67,557,864	0	0.000%
Orange City	446,136,500	0	0.000%
Ormond Beach	2,269,411,643	0	0.000%
Pierson	49,333,302	0	0.000%
Ponce Inlet	169,838,467	0	0.000%
Port Orange	2,469,426,353	4,975	0.000%
South Daytona	482,748,537	0	0.000%
Unincorporated	4,680,525,914	0	0.000%
<b>TOTAL</b>	<b>\$21,502,788,893</b>	<b>\$17,678</b>	<b>0.000%</b>

Source: National Climatic Data Center (2010) and Volusia County GIS Department

### **Qualitative Assessment of Lightning Vulnerability**

Like hail, lightning does not affect certain geographical areas of the county at higher rates than others. However, certain types of structures, including those with large antennas or those that are taller than the buildings surrounding them, are typically at a higher risk for lightning strikes. In particular, communication facilities may be at a higher risk of a lightning strike, while school assets such as football stadiums with lighting could also be at an increased level of vulnerability.

Secondly, structures that are isolated in areas of low tree coverage are at a higher risk for lightning strikes. Jurisdictions within the county where this could be more common include DeLand (\$1,379,957,569 worth of improved property value), Lake Helen (\$92,912,745), Orange City (\$446,136,500) and Pierson (\$49,333,302). These areas are generally more rural in nature and have a higher rate of isolated critical facilities and structures.

Beachside structures located near or along the Atlantic Ocean are also at a higher vulnerability to lightning damage. Many utilities are located in these locations. However, most of the buildings located along the beach are hotels, businesses and high rise condos. There are not many critical facilities located along the Atlantic Ocean in Volusia County, as the majority of those facilities are located inland along the barrier islands or are located west of the Intracoastal Waterway.

## SECTION 6: VULNERABILITY ASSESSMENT

### 6.7 SEVERE WINTER STORM

Severe winter storms, typically consisting of snow and ice, infrequently occur in Volusia County. Since it cannot be predicted where severe winter storms (as defined in the *Hazard Profiles* section) may occur, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported severe winter storm occurrences have been factored into this vulnerability assessment<sup>4</sup>. Winter storms can last days or weeks, depending on the storm and regional climate norms (El Nino year, etc.). Winter storms in Florida typically last less than one week. To estimate losses due to extreme wind, NCDRC historical thunderstorm wind loss data for occurrences in the County were used to develop an extreme wind stochastic model. In this model:

- Losses were obtained and scaled for inflation; Average historic extreme wind damageability was used to generate losses for historical thunderstorm wind events where losses were not reported; Expected annualized losses were calculated through a non-linear regression of historical data; and; Probabilistic losses were scaled to account for would-be losses where no exposure/instrument was present at the time of the event.

**Table 6.8** shows total exposure and potential annualized property losses and percent loss ratios resulting from severe winter storm for Volusia County. While all of Volusia County’s inventoried assets are equally exposed to severe winter storm, any anticipated future damages or losses are expected to be minimal. The table below depicts wind chill categories often associated with severe winter storms.

**FIGURE 6.9: Wind-Chill Advisory Table**

Temperature		Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	-98
Frostbite Times		30 Mins						10 Mins						5 Mins						
Wind chill is calculated by: $Windchill (^{\circ}F) = 35.74 + 0.6215T - 35.75(V^{0.16}) - 0.4275T(V^{0.16})$ Where: T = Air Temperature (F), V = Wind Speed (mph), ^ = raised to a power (exponential)																				

Source: National Weather Service

<sup>4</sup> It is possible that additional extreme wind events may have occurred since 1950 that were not reported to NCDRC and are not accounted for in this analysis.

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.8: Total Exposure/ Potential Annualized Losses from Severe Winter Storm**

JURISDICTION	EXPOSURE (TOTAL IMPROVED VALUE OF PARCELS)	ANNUALIZED LOSSES	ANNUALIZED PERCENT LOSS RATIO
Daytona Beach	3,113,758,732	0	0.000%
Daytona Beach Shores	108,379,184	0	0.000%
DeBary	855,016,726	0	0.000%
DeLand	1,379,957,569	0	0.000%
Deltona	2,642,766,558	0	0.000%
Edgewater	806,296,779	0	0.000%
Holly Hill	432,668,504	0	0.000%
Lake Helen	92,912,745	0	0.000%
New Smyrna Beach	1,436,053,516	0	0.000%
Oak Hill	67,557,864	0	0.000%
Orange City	446,136,500	0	0.000%
Ormond Beach	2,269,411,643	0	0.000%
Pierson	49,333,302	0	0.000%
Ponce Inlet	169,838,467	0	0.000%
Port Orange	2,469,426,353	0	0.000%
South Daytona	482,748,537	0	0.000%
Unincorporated	4,680,525,914	0	0.000%
<b>TOTAL</b>	<b>\$21,502,788,893</b>	<b>\$0</b>	0.000%

Source: National Climatic Data Center and Volusia County GIS Department

### Location-Specific Risk

Severe winter storms typically affect entire regions of continents, therefore in the event of a severe winter storm, most of the region would be affected uniformly. However, areas close to the Atlantic Ocean and large regional water bodies could be impacted with a greater magnitude in the event of lake effect wind, sleet or snow conditions. Moreover, areas heavy with agriculture could be at a greater risk from an economic perspective, as these land uses can incur heavy losses when a winter storm strikes. While extremely rare, these types of events have occurred and documented within Volusia County. Winter storms tend to affect transportation infrastructure (such as bridges and boat traffic) in addition to power sources. Moreover, the Town of Pierson is the “Fern Capital of the World” and could incur a large financial loss in the event of a severe winter storm. All populations of Volusia County are vulnerable to severe winter storms despite the rarity of such events. However, the elderly, low income and homeless populations are at a disproportionately higher level of vulnerability to these events.

As stated above, agricultural areas are the most vulnerable areas to severe winter storms. However, damage to critical facilities, businesses and homes can occur as a result of these events. While annualized losses for these events are very hard to measure due to the low probability of these storms, pipe freezes, as well as roof deterioration can occur.

## 6.8 THUNDERSTORMS

Thunderstorms frequently occur in Volusia County. Since it cannot be predicted where thunderstorms may occur, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported thunderstorm occurrences have been factored into this vulnerability assessment<sup>5</sup>. To estimate losses due to extreme wind, NCDRC historical thunderstorm wind loss data for occurrences in the county were used to develop an extreme wind stochastic model. In this model:

- Losses were obtained and scaled for inflation; Average historic extreme wind damageability was used to generate losses for historical thunderstorm wind events where losses were not reported; Expected annualized losses were calculated through a non-linear regression of historical data; and; Probabilistic losses were scaled to account for would-be losses where no exposure/instrument was present at the time of the event.

**Table 6.9** shows total exposure and potential annualized property losses and percent loss ratios resulting from thunderstorms for Volusia County. Although, the annualized losses from thunderstorms in Volusia County are low, the probability and frequency are high. Therefore, it is anticipated that thunderstorms will continue to threaten life and pose property damage throughout the county.

<b>TABLE 6.9: Total Exposure and Potential Annualized Losses from Thunderstorm</b>			
<b>JURISDICTION</b>	<b>EXPOSURE (TOTAL IMPROVED VALUE OF PARCELS)</b>	<b>ANNUALIZED LOSSES</b>	<b>ANNUALIZED % LOSS RATIO</b>
Daytona Beach	3,113,758,732	2,638	0.000%
Daytona Beach Shores	108,379,184	0	0.000%
DeBary	855,016,726	205	0.000%
DeLand	1,379,957,569	8,111	0.001%
Deltona	2,642,766,558	3,529	0.000%
Edgewater	806,296,779	12,783	0.002%
Holly Hill	432,668,504	429	0.000%
Lake Helen	92,912,745	0	0.000%
New Smyrna Beach	1,436,053,516	768	0.000%
Oak Hill	67,557,864	0	0.000%
Orange City	446,136,500	652	0.000%
Ormond Beach	2,269,411,643	1,377	0.000%
Pierson	49,333,302	326	0.001%
Ponce Inlet	169,838,467	0	0.000%
Port Orange	2,469,426,353	1,015	0.000%
South Daytona	482,748,537	834	0.000%
Unincorporated	4,680,525,914	20,583	0.000%
<b>TOTAL</b>	<b>\$21,502,788,893</b>	<b>\$53,250</b>	<b>0.000%</b>

Source: National Climatic Data Center and Volusia County GIS Department

## SECTION 6: VULNERABILITY ASSESSMENT

### **Qualitative Assessment of Thunderstorm Vulnerability**

Severe weather events such as thunderstorms can impact all areas of Volusia County, depending on the location of the thunderstorm, its direction, and its lateral speed across the Earth's lower atmosphere. These events can cause damage to structures, disruption of utilities and surface/air transportation.

While all populations can be impacted by thunderstorms, lack of shelter puts the homeless at highest risk. Spectator's at large outdoor special events and/or recreational areas are highly susceptible to the effects of thunderstorms.

Further details are provided in the profiles for lightning, flooding, hail, wind, winter storms, tornadoes and storm surge all of which highlight the many risks that come about from thunderstorms.

## 6.9 TORNADO

Historical evidence shows that Volusia County is vulnerable to tornadic activity. This hazard can result from severe thunderstorm activity or may occur during a major tropical storm or hurricane. Since it cannot be predicted where a tornado may touch down, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported tornadoes have been factored into this vulnerability assessment<sup>6</sup>.

While all populations in Volusia County can be impacted, the most vulnerable are homeless, the elderly and those of lower income. Communities such as mobile home parks and manufactured housing parks are the most susceptible to the effects of tornadoes. Volusia County has Depending on location severity, tornadoes can cause social disruption in the form of electrical outages, transportation problems and economic loss. All populations and infrastructure are vulnerable to tornadoes due to the high winds and debris field.

To estimate losses due to tornadoes, NCDC historical tornado loss data for occurrences in the County were used to develop a tornado stochastic model. In this model:

- Losses were scaled for inflation;
- Average historic tornado damageability was used to generate losses for historical tornadic events where losses were not reported;
- Expected annualized losses were calculated through a non-linear regression of historical data; and
- Probabilistic losses were scaled to account for would-be losses where no exposure/instrument was present at the time of the event.

Volusia County has mobile home/manufactured home parks throughout the county, both east and west sides which are equally vulnerable to impacts of tornadoes. Many of the parks are 55 and older only while others have very old mobile homes that are not built to today's building standards leaving the elderly and low income populations more at risk.

**Table 6.10** shows total exposure and potential annualized property losses and percent loss ratios resulting from the tornado hazard for Volusia County. Although, the annualized losses from tornadoes vary in Volusia County, the probability and frequency are high for tornadic activity is high throughout the County. Therefore, it is anticipated that tornadoes will continue to threaten life and pose property damage throughout the County. **Table 6.11** corresponds with **Figure 6.7** and depicts 2014 parcel exposure to differing proximities of tornadoes from 1950 through 2014.

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<sup>6</sup> It is possible that additional tornado events may have occurred since 1950 that were not reported to NCDC and are not accounted for in this analysis.

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.10: Total Exposure and Potential Annualized Losses from Tornado**

JURISDICTION	EXPOSURE (TOTAL IMPROVED VALUE OF PARCELS)	ANNUALIZED LOSSES	ANNUALIZED PERCENT LOSS RATIO
Daytona Beach	3,113,758,732	1,251,126	0.040%
Daytona Beach Shores	108,379,184	119	0.000%
DeBary	855,016,726	14,631	0.002%
DeLand	1,379,957,569	135,515	0.010%
Deltona	2,642,766,558	172	0.000%
Edgewater	806,296,779	57,187	0.007%
Holly Hill	432,668,504	0	0.000%
Lake Helen	92,912,745	0	0.000%
New Smyrna Beach	1,436,053,516	439,421	0.031%
Oak Hill	67,557,864	12,280	0.018%
Orange City	446,136,500	0	0.000%
Ormond Beach	2,269,411,643	123,890	0.005%
Pierson	49,333,302	1,398	0.003%
Ponce Inlet	169,838,467	172	0.000%
Port Orange	2,469,426,353	22,834	0.001%
South Daytona	482,748,537	305	0.000%
Unincorporated	4,680,525,914	991,598	0.021%
<b>TOTAL</b>	<b>\$21,502,788,893</b>	<b>\$3,050,648</b>	<b>0.014%</b>

Source: National Climatic Data Center and Volusia County GIS Department

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.11: 2014 Parcel Exposure to Tornado Proximity (Tornado Tracks 1950-2014)**

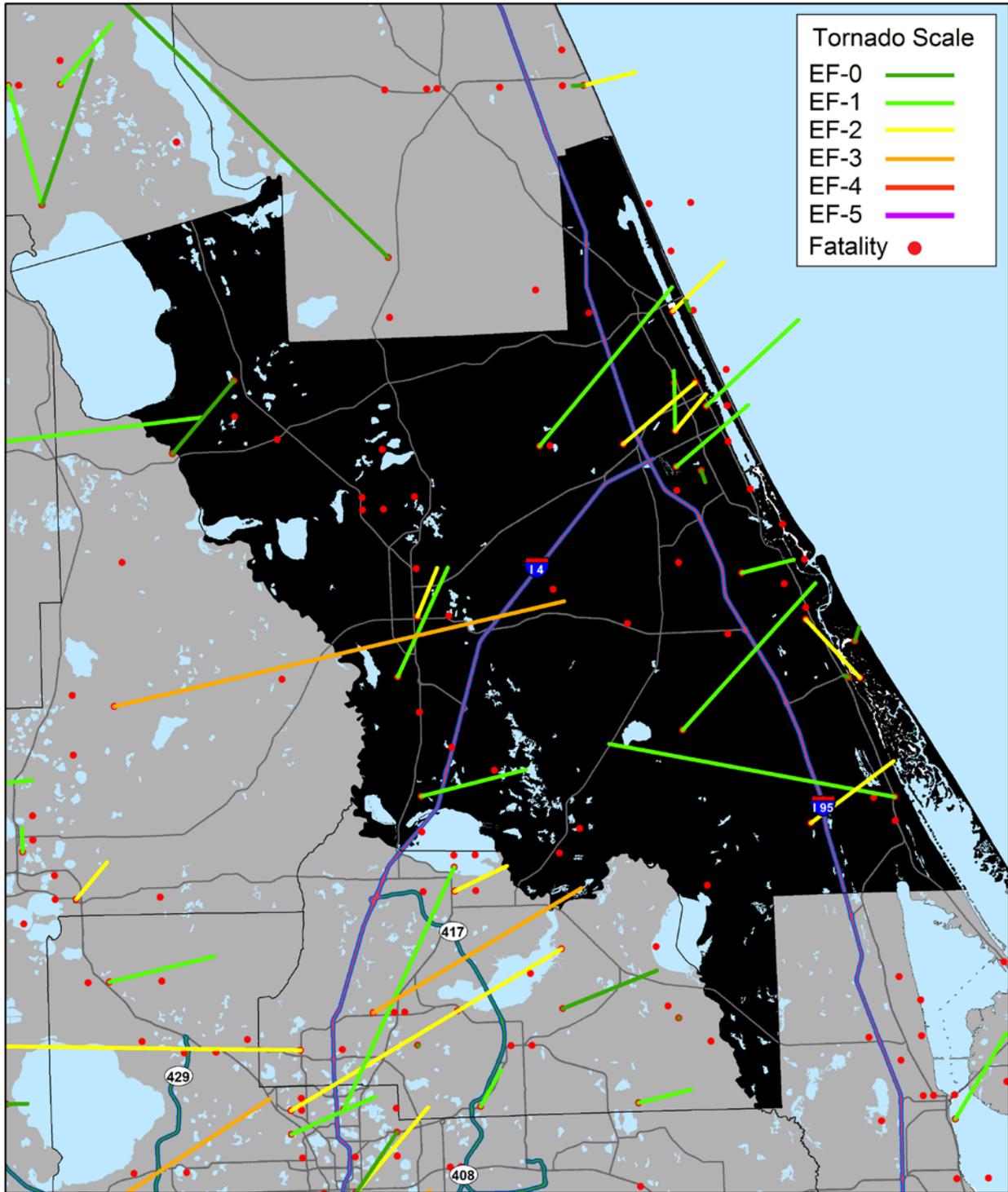
Financial Exposure to Hazard Zones – Cumulative Financial Values within Zones						
Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Direct Hit	2,654 0.5%	1,589 59.9% built	\$357,981,388	\$129,921,796	\$1,027,693,523	\$415,862,124
0.01 to 0.10 Miles	18,232 3.8%	12,718 69.8% built	\$397,935,020	\$896,393,772	\$1,283,072,167	\$891,194,035
0.11 to 0.25 Miles	28,366 5.9%	20,810 73.4% built	\$638,264,160	\$1,197,185,601	\$1,817,352,531	\$1,358,263,291
0.26 to 0.50 Miles	45,745 9.5%	32,852 71.8% built	\$972,755,209	\$1,854,687,959	\$2,787,335,498	\$2,102,244,561
0.51 to 1.00 Miles	80,845 16.9%	56,658 70.1% built	\$1,718,738,964	\$3,317,786,482	\$4,959,058,049	\$3,946,603,729

Build-Year Summary of Built Parcels within Hazard Zones – Build Year Breakdown by Hazard Zone						
Hazard Zone	Built Parcels	Built Pre-1970	Built 1970-1979	Built 1980-1989	Built 1990-1999	Built 2000-2014
Direct Hit	1,589	649 40.8% of built	253 15.9% of built	318 20.0% of built	164 10.3% of built	205 12.9% of built
0.01 to 0.10 Miles	12,718	5,786 45.5% of built	2,120 16.7% of built	2,205 17.3% of built	1,059 8.3% of built	1,548 12.2% of built
0.11 to 0.25 Miles	20,810	9,842 47.3% of built	3,417 16.4% of built	3,671 17.6% of built	1,665 8.0% of built	2,215 10.6% of built
0.26 to 0.50 Miles	32,852	14,705 44.8% of built	5,173 15.7% of built	6,468 19.7% of built	2,982 9.1% of built	3,524 10.7% of built
0.51 to 1.00 Miles	56,658	19,871 35.1% of built	8,840 15.6% of built	14,175 25.0% of built	6,403 11.3% of built	7,369 13.0% of built

Land Use Summary of Parcels within Hazard Zones – Number of Parcels Per Land Use						
Hazard Zone	Low Density Residential	Med/Hi. Density Residential	Commercial and Office	Industrial	Institutional	Agricultural
Direct Hit	1,488	99	243	42	436	253
0.01 to 0.10 Miles	11,846	700	1,950	210	2,316	831
0.11 to 0.25 Miles	19,602	972	2,759	480	3,070	1,074
0.26 to 0.50 Miles	32,172	1,676	4,943	816	4,399	1,121
0.51 to 1.00 Miles	59,359	3,103	5,641	2,189	4,755	3,533

Source: National Climatic Data Center, Volusia County GIS (2014)

FIGURE 6.10: Historic Tornado Tracks and Fatalities (1950-2014)



Source: National Climatic Data Center (2014)

### **Qualitative Assessment of Tornado Vulnerability**

Like many other hazards detailed in this report, tornadoes can occur very quickly and do not specifically impact one area of the county higher than another. The sample size taken for the Volusia County area to map tornado paths (as shown on the previous page) only covers a 64 year period, so any delineation of vulnerabilities to specific areas would be unfounded. However, on the statewide scale, trends have been identified and will be described below. Many patterns have emerged in terms of the types of tornadoes that tend to hit Volusia County. There are two primary types of tornado systems that hit.

In Florida, large tornadoes (in the EF-2 to EF-4 range) have typically been concentrated near the central portion of the peninsula (near the Orlando Metropolitan area), moving west-southwest to east-northeast and covering large swaths of land. In the case of a large tornado, the most likely area of Volusia County to be hit initially would be areas in the western portions of the county, specifically those areas that are adjacent to the boundaries with Seminole and Lake County. While warnings for tornado emergencies can be very last-minute, data tends to show that large tornadoes in Florida tend to strike the east coast after tornado activity (or pre-tornado activity) has already been identified across the western and central portions of the peninsula.

The second (and more common) type of tornado to hit Volusia County would be a small tornado, more than likely in the EF-0 to EF-1 range. These storms do not follow large-scale patterns like larger tornadoes in Florida can; thus, warnings for these types of storms can be minimal (or nonexistent) and the locations where these tornadoes strike can have a larger element of randomness. These events tend to unravel quickly and without notice. As stated above, while no clear geographic pattern has emerged for smaller-scale tornadoes in Volusia County, a disproportionate number have hit areas close to the Intracoastal Waterway during the 64 year observation period. Five tornadoes on record have crossed Interstate-95 in Volusia County.

Since strong patterns have not emerged for the most likely event (EF-0 or EF-1 tornado), larger tornadoes can develop over longer periods of time and can affect critical facilities anywhere within the county, as discussed above. Thus, critical facilities at the highest risk for strong tornado damage (and loss of human life) would generally be those located in the western portion of the county due to the shorter duration of time allowed for mitigation of these properties in the event of an incoming storm. As shown in table 6.11, there is a small chance that an individual parcel will be affected by a tornado as compared to the other hazards identified in this report. 0.5% of current parcels within the county have been directly hit by a tornado since 1950; a cumulative 4.3% of parcels have been within 0.1 miles of a tornado since 1950; and a cumulative 10.2% of parcels within Volusia County have been within 0.25 miles of a tornado since 1950. A combined 26.4% of parcels within the county have been between 0.25 and 1.00 miles of a tornado since 1950.

This leaves a total of 63.4% of parcels within the county that have not experienced a tornado within one mile of the parcel boundary since 1950, further exemplifying the rarity that one of these events will effect individual critical facilities, homes and businesses within the county. However, although these events are rare, tornadoes can have devastating effects on buildings. Infrastructure can be completely lost in a tornado, so the weighted risk of these events (when comparing the probability of the event with the damage incurred during the event) are very high, if not comparable to the other hazards identified within this report. Older buildings are at higher than normal risk for tornado damage as a result of strict building codes over time. In conclusion, tornadoes present a rare but dangerous threat to the county.

## HYDROLOGIC HAZARDS

## 6.10 COASTAL EROSION

All of the coastal areas in Volusia County are prone to coastal erosion, and nearly half of the 47 miles of shoreline are considered critically eroded. Populations are not explicitly threatened by coastal erosion. However, major economic losses can be incurred to beachfront properties due to coastal erosion. Coastal erosion is typically measured as the annual shoreline change for a given beach cross-section of profile over a long period of time. The NCDP has reported five events involving coastal erosion in Volusia County since 1998. However, these events also include losses from hurricane impacts such as storm surges. The NCDP reported events include losses for jurisdictions outside of Volusia County. As such, it is not possible to determine annualized losses from coastal erosion for the coastal jurisdictions in Volusia County. Coastal erosion exposure was assessed by quantifying the number of people and property that are located within 0.5 miles inland from the shoreline in areas where critical erosion has been documented by the Florida Department of Environmental Protection.

**Table 6.12** provides the number of people and number and value of improved properties that are susceptible to coastal erosion. Coastal erosion is very likely to continue impacting the coastal areas of Volusia County. There are currently over 5,000 improved properties that are at risk to coastal erosion in Daytona Beach, Daytona Beach Shores, New Smyrna Beach, Ormond Beach and areas in unincorporated Volusia County. Jurisdictions with critically eroded beaches in Volusia County actively participate in the federal beach nourishment program.

**TABLE 6.12: Total Exposure from Coastal Erosion**

JURISDICTION	AT-RISK AREAS (within 0.5 miles of critical erosion)			
	Number of People at Risk	Number of Parcels at Risk	% of Improved Parcels at Risk	Value of Parcels at Risk
Daytona Beach	4,502	1,428	7.61%	299,158,596
Daytona Beach Shores	3,303	379	70.71%	84,001,016
New Smyrna Beach	2,661	1,356	12.25%	157,731,953
Ormond Beach	872	468	3.01%	81,132,737
Ponce Inlet	25	12	1.09%	3,193,502
Unincorporated	3,751	1,518	3.32%	188,036,944
<b>TOTAL</b>	<b>15,114</b>	<b>5,161</b>	<b>2.76%</b>	<b>\$813,254,748</b>

Source: Florida Department of Environmental Protection and Volusia County GIS Department

**Qualitative Assessment of Coastal Erosion Vulnerability**

Coastal erosion is a considerable threat to beachfront properties within five jurisdictions of the county alongside unincorporated areas. A total of 5,161 parcels are at direct risk for coastal erosion, representing more than \$800 million in property value. Properties at the highest risk are those with low elevations, as wave action and dune-degradation can affect the integrity of the lot foundation. Parcels with lower foundations, or those that have not been mitigated (or raised above base flood elevation) are at higher risk for water damage, loss of personal property, electrical damage, structural collapse and loss of life. The most susceptible cities to coastal erosion within the county are Daytona Beach and New Smyrna Beach, which account for a large percentage of shoreline properties. Moreover, from a financial risk perspective, storm surge presents a unique challenge, as beachfront properties are typically the higher-valued properties within the county. The county's Lifeguard Headquarters and Administration

## SECTION 6: VULNERABILITY ASSESSMENT

Building is located on the beach in Daytona Beach and provides public safety and lifeguard duties to all the beach area. The Ponce Inlet Lighthouse is at risk and has had extensive work done around by the US Army Corps of Engineers to re-nourish the sand and install rock jetties in the inlet area. Beach renourishment was also completed after the 2004 hurricane season all along New Smyrna Beach from a spoil island in the Halifax Intracoastal River.

There are two piers with restaurants that are susceptible to storm surge with Joe's Crab Shack on the Main Street Pier being a major tourist draw to the Boardwalk Entertainment Area of Daytona Beach. The entire shoreline along with the condominiums, residential homes, businesses, and restaurants can be susceptible to coastal erosion depending on the strength and direction of the storm. The North Peninsula State Recreation Area in Ormond-By-The-Sea and A1A roadway in the area is at higher risk than other areas in the county but is rural and mostly undeveloped.

**6.11 DROUGHT**

Volusia County is uniformly vulnerable to drought. Drought is typically associated with crop damage, and not necessarily the built environment (i.e., improved property). However, research (as noted in the *Hazards Profiles* section) has shown that drought conditions have caused wildfires in 1985, 1988, 1998 and 2009. Droughts can impact the Florida Aquifer, which can affect the supply of water to Volusia County residents. Many residents receive their water from personal wells and the County’s public water supply is also drawn from wells. Drought can cause crop loss, livestock reductions, fish habitat disruption, and can also be associated with the increase of wildfire threat, which in turn places both human and wildlife population at highest risk. Moreover, reduced lake and canal depths can impact boating traffic and access to certain waterways, further reducing property values in these locations. The Lake Beresford area in DeLand has a large tourist draw for fishing and house boat rentals which could be impacted by severe drought conditions. The St. John’s River can be impacted by drought from other areas as far south as Lake Okeechobee because it runs from south to north.

Losses were estimated based on occurrences that were reported to the NCD<sup>7</sup>. To estimate losses due to extreme drought, NCD historical drought loss data for occurrences in the County were used to develop an extreme drought stochastic model. In this model:

- Losses were obtained and scaled for inflation;
- Average historic extreme wind damageability was used to generate losses for historical thunderstorm wind events where losses were not reported;
- Expected annualized losses were calculated through a non-linear regression of historical data;
- Probabilistic losses were scaled to account for would-be losses where no exposure/instrument was present at the time of the event.

**Table 6.13** shows total exposure and potential annualized property losses and percent loss ratios resulting from drought for Volusia County. Although, the annualized losses are \$0, it should be noted that drought conditions can exacerbate wildfire potential. Wildfire losses are not quantified in this assessment, as drought related (i.e., wildfire) losses are reported separately. Wildfire exposure and losses are provided in this vulnerability assessment as a separate hazard. The probability of drought events in Volusia County is high. The table below depicts drought criteria as determined by the NWS.

**Table 6.12: National Weather Service Drought Criteria**

National Weather Service Alerts	
Alert	Criteria
D0 Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1 Moderate Drought	Some damage to crops, pastures, streams, reservoirs, or wells low, some water shortages developing or imminent, and voluntary water-use restrictions requested.
D2 Severe Drought	Crop or pasture losses are likely, water shortages common and water restrictions imposed.
D3 Extreme Drought	Major crop and pasture losses with widespread water shortages or restrictions.
D4 Exceptional Drought	Exceptional and widespread crop and pasture loss, shortages of water in reservoirs, streams, and wells creating water emergencies.

Source: National Weather Service

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.14: Total Exposure and Potential Annualized Losses from Drought**

JURISDICTION	EXPOSURE (TOTAL IMPROVED VALUE OF PARCELS)	ANNUALIZED LOSSES	ANNUALIZED PERCENT LOSS RATIO
Daytona Beach	3,113,758,732	0	0.000%
Daytona Beach Shores	108,379,184	0	0.000%
DeBary	855,016,726	0	0.000%
DeLand	1,379,957,569	0	0.000%
Deltona	2,642,766,558	0	0.000%
Edgewater	806,296,779	0	0.000%
Holly Hill	432,668,504	0	0.000%
Lake Helen	92,912,745	0	0.000%
New Smyrna Beach	1,436,053,516	0	0.000%
Oak Hill	67,557,864	0	0.000%
Orange City	446,136,500	0	0.000%
Ormond Beach	2,269,411,643	0	0.000%
Pierson	49,333,302	0	0.000%
Ponce Inlet	169,838,467	0	0.000%
Port Orange	2,469,426,353	0	0.000%
South Daytona	482,748,537	0	0.000%
Unincorporated	4,680,525,914	0	0.000%
<b>TOTAL</b>	<b>\$21,502,788,893</b>	<b>\$0</b>	0.000%

Source: National Climatic Data Center and Volusia County GIS Department

### **Qualitative Assessment of Drought Vulnerability**

While droughts do not have physical effects on the building stock within the county, many indirect losses can occur to personal property and critical facilities as a result of drought conditions. Thus, annualized losses are not easily identifiable. Agricultural areas are throughout the county but the northwest area including the Town of Pierson is most vulnerable. Losses within the agricultural industry, specifically, can have a trickle-down effect on local businesses (such as tool or heavy machinery companies), resulting in indirect financial losses to businesses and institutions. As a result of the financial losses to individual businesses, residents of Volusia County can lose their jobs, resulting in a net economic loss for the county. Thus, the most realizable losses as a result of a drought are financial – not physical – as is the case with the other hazards identified in this report. The urbanized communities along the coast are less vulnerable economically due to their location and non-agricultural economic base.

A second indirect loss as a result of loss is physical, but comes in the form of a sinkhole. Data suggests that both an excess of rainfall (flooding) and drought conditions can have negative effects on the limestone bed in the state of Florida. Thus, the main physical deterioration as a result of drought conditions to the county's building stock could come in the form of a sink hole, which is also discussed in this report.

**6.12 FLOOD**

In order to assess flood risk, a GIS-based analysis was used to estimate exposure to flood events using FEMA’s preliminary Digital Flood Insurance Rate Map (DFIRM) data in combination with local tax assessor records (2009). The determination of assessed value at-risk (exposure) was calculated using GIS analysis by summing the total assessed building values for improved properties that were confirmed to be located within an identified Zone A/AE (100-year floodplain), Zone VE (100-year coastal flood zone, associated with wave action), and Zone X (500-year floodplain). It is important to note that Volusia County recently updated their flood maps, which were released in the beginning of 2014. It is recommended that the flood analyses be revised once the new flood maps are available. Flooding can impact all populations, primarily those who live, work or recreate anywhere within the county. Flooding can also cause property loss to structures located within the 100-year floodplain.

**Table 6.14** (on the next page of this document) lists the land uses of properties, the percentage of properties and the property values that are located in the 100-year (A/AE), coastal and 100-year (VE) floodplains. **Table 6.14** corresponds with **Figure 6.8**, which depicts all 100-year flood hazard zones. For a listing and generalized maps of all Repetitive Loss Properties within the County and its 16 jurisdictions, please reference the 2013 Floodplain Management attachment (Appendix I). Alongside the Floodplain Management Plan, many repetitive loss properties are listed in the Mitigation Action Plan as part of this report. The table below summarizes types of flooding advisories.

**FIGURE 6.11: National Weather Service Alerts**

Alert	Criteria
Flood Watch	Atmospheric conditions over a large area, varying in size from multiple counties to multiple states, support the development of heavy rain and/or thunderstorms that are capable of producing flooding. A flood watch implies a longer period of relatively lighter rains, adding up to a large amount of rain. Longer-term flooding implies a slower or steadier rise in the water levels of creeks, streams and larger rivers. Roads can also become flooded, but it is usually more gradual, allowing motorists to monitor conditions more closely.
Flood Warning	A Flood Warning is issued by the National Weather Service when heavy rain has been occurring, and flooding is either occurring or will occur within a specified time, usually within 60 minutes.
Flash Flood Watch	Implies a shorter period of heavier rain. Generally, if flooding is expected within six hours of the onset of rain, a Flash Flood Watch is most appropriate. Flash flooding by definition suggests rapidly rising water, such as a surge of water heading rapidly downstream in a creek or small river. It could also be rapidly rising water on roadways, which can cause motorists to become stranded in vehicles, or even worse, washed into creeks and small rivers due to rapid runoff.
Flash Flood Warning	Atmospheric conditions over a large area, varying in size from multiple counties to multiple states, support the development of heavy rain and/or thunderstorms that are capable of producing flash flooding: A Flash Flood Warning is issued by the National Weather Service when heavy rain has been occurring, and flash flooding is either occurring or will occur within a specified time, usually within 60 minutes.
Urban and Small Stream Advisory	Flooding of small streams, streets and low-lying areas, such as railroad underpasses and urban storm drains is occurring.

Source: National Weather Service

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**TABLE 6.15: 2014 Parcel Exposure to Flood Hazard Zones (2014 DFIRM)**

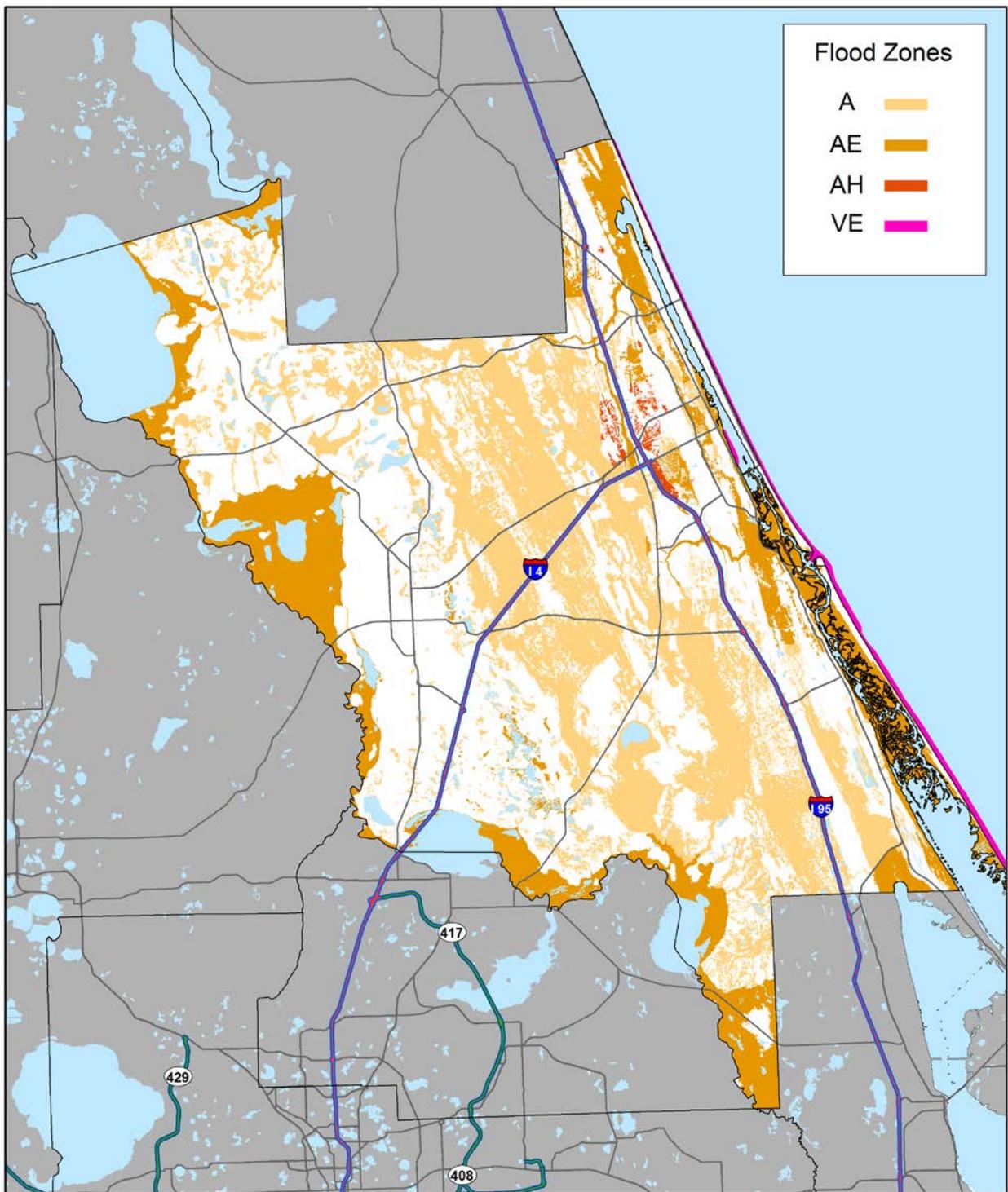
Financial Exposure to Hazard Zones – Cumulative Financial Values within Zones						
Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	75,397 15.7%	21,829 29.0% built	\$1,566,139,476	\$1,658,053,211	\$2,821,521,387	\$1,883,285,788
AE	59,111 12.3%	37,718 63.8% built	\$2,589,902,259	\$3,100,684,778	\$5,537,361,006	\$4,248,685,350
AH	1,350 0.3%	821 60.8% built	\$187,904,358	\$357,214,128	\$532,334,860	\$410,640,777
VE	1,637 0.3%	962 58.8% built	\$516,287,916	\$226,763,993	\$726,174,280	\$605,768,181

Build-Year Summary of Built Parcels within Hazard Zones – Build Year Breakdown by Hazard Zone						
Hazard Zone	Built Parcels	Built Pre-1970	Built 1970-1979	Built 1980-1989	Built 1990-1999	Built 2000-2014
A	21,829	6,018 27.6% of built	3,087 14.1% of built	4,128 18.9% of built	3,385 15.5% of built	5,211 23.9% of built
AE	37,718	10,970 29.1% of built	6,611 17.5% of built	9,540 25.3% of built	5,350 14.2% of built	5,247 13.9% of built
AH	821	18 2.2% of built	137 16.7% of built	305 37.1% of built	110 13.4% of built	251 30.6% of built
VE	962	530 55.1% of built	144 15.0% of built	123 12.8% of built	84 8.7% of built	81 8.4% of built

Land Use Summary of Parcels within Hazard Zones – Number of Parcels Per Land Use						
Hazard Zone	Low Density Residential	Med/Hi. Density Residential	Commercial and Office	Industrial	Institutional	Agricultural
A	46,668	1,041	2,310	973	9,155	12,324
AE	37,647	2,470	3,976	1,034	7,317	4,229
AH	656	132	251	69	124	36
VE	722	272	453	0	137	0

Source: FEMA Flood Insurance Rate Map (2014) and Volusia County GIS Department  
For Jurisdiction-specific vulnerability data, view Appendix I (2013 Floodplain Management Plan – Jurisdiction Appx.)

FIGURE 6.12: Flood Insurance Rate Zones



Source: FEMA (DFIRM Series 2014)

## SECTION 6: VULNERABILITY ASSESSMENT

### **Qualitative Assessment of Flood Vulnerability**

Flooding is among the most prominent of hazards in Volusia County, as a large portion of the county's critical facilities, residences and businesses are located within the 100-year floodplain. The most prominent flood zone in Volusia County is Flood Zone 'A', a hazard zone that includes 15.7% of the county's parcels and a total of 21,829 built structures, totaling close to 3 billion dollars in assessed property value within the hazard zone. Flood Zone 'AE' is the next most prominent zone within the county, including 12.3% of the county's parcels and a total of 37,718 built structures, amassing an area with a cumulative property value just above \$5.5 billion.

It is important to note that while Flood Zone 'A' envelopes a much larger number of parcels with 29.0% of those parcels built, a staggering 63.8% of the parcels within Flood Zone 'AE' are built. Thus, most of the vulnerability within Volusia County for flooding occurs within Flood Zone 'AE'. Flood Zones 'AH' (part of the 100-year floodplain) and 'VE' (the wave velocity zone) represent just 0.6% of the county's parcels. The majority of the parcels within each flood zone have a land use of low density residential.

Parcels at the highest risk for flooding damage are those with the lowest elevations. While a flood zone can envelope properties at a specified range of elevations, the variability in the elevations within those zones make certain buildings more prone to flooding damage than others. Additionally, structures that are located below the roadway system adjacent to the building (without a bio-swale buffer) are at extreme risk for flooding, as transportation networks are among the first areas to become inundated in a flood situation.

Many critical facilities are located within the 100-year floodplain. Adverse to the results when analyzing parcels within each zone on a county level, the majority of critical facilities that are located within a flood zone in Volusia County are located within Flood Zone 'A'. Of the 406 core critical facilities examined in this report, 94 are located in Flood Zone 'A', while 33 are located in Flood Zone 'AE'. A majority of the critical facility structures located within the 100-year floodplain are located in Volusia County's beach side communities. These include fire stations in New Smyrna Beach, Ponce Inlet, Daytona Beach Shores, Daytona Beach and Ormond Beach. There are hospitals at risk in low lying areas in Orange City and DeLand. Maytown Road in Oak Hill to Osteen/Enterprise is not an evacuation route because of repeated flooding.

Structural damage as a result of flooding can result in a loss of electricity, which can cause communication problems throughout the county. Moreover, physical damage due to water can result in the loss of personal property (for business owners and homeowners), while heavy, often expensive equipment located within critical facilities can be damaged.

In terms of the damage incurred to structures as a result of flooding, the same types of damage can be seen as a result of storm surge. The ecological impacts hazard materials debris and accidents to land and waterways would be extensive from all types of flooding. The impacts on agriculture, tourism, and transportation would be extensive.

### 6.13 STORM SURGE

The storm surge assessment was conducted by identifying the people and property that are located in storm surge inundation zones using data provided by Volusia County<sup>8</sup>. Storm surge affects the east side of the county, generally populations located east of Interstate 95. Storm surge can cause extensive property loss to businesses and homes; can inundate transportation networks with water and can cause long term economic losses related to tourism. The ecological impacts on turtle and bird nesting, hazardous materials debris and accidents to land and waterways would be extensive from all types of storm surge.

**Tables 6.15** shows the number of residents at risk, per jurisdiction, to Category 1, Category 3 and Category 5 storm surge effects. **Table 6.16** lists the land uses of properties, the percentage of properties and the property values that are located in the Category 1, 2, 3, 4 and 5 storm surge zones, respectively. **Table 6.16** corresponds with **Figure 6.9**, which depicts the storm surge hazard zones.

**TABLE 6.16: Persons at Risk to Category 1/3/5 Storm Surge by Jurisdiction**

JURISDICTION	Persons at Risk (Cat. 1)	Persons at Risk (Cat. 3)	Persons at Risk (Cat. 5)
Daytona Beach	2,203	4,320	29,031
Daytona B. Shores	29	36	864
DeBary	0	0	0
DeLand	0	0	0
Deltona	0	0	0
Edgewater	128	1,353	17,042
Holly Hill	165	695	12,029
Lake Helen	0	0	0
New Smyrna Beach	3,891	15,501	18,553
Oak Hill	44	88	1,377
Orange City	0	0	0
Ormond Beach	961	2,152	16,093
Pierson	0	0	0
Ponce Inlet	356	980	1,481
Port Orange	1,896	4,631	22,220
South Daytona	1,223	1,858	13,273
Unincorporated	2,031	5,595	15,371
<b>TOTAL</b>	<b>12,927</b>	<b>37,209</b>	<b>147,334</b>

Source: Volusia County GIS Department

<sup>8</sup> Volusia County provided surge inundation zones for Categories 1, 3 and 5.

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.17: 2014 Parcel Exposure to Storm Surge Zones (by Hurricane Category)**

Financial Exposure to Hazard Zones – Cumulative Financial Values within Zones						
Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	12,163 2.5%	7,235 59.5% built	\$1,444,181,892	\$764,514,315	\$2,159,534,760	\$1,743,941,309
Category 2	25,270 5.3%	16,406 64.9% built	\$1,999,988,212	\$1,390,997,239	\$3,329,352,505	\$2,714,248,118
Category 3	87,475 18.2%	64,163 73.4% built	\$3,392,472,185	\$3,812,465,872	\$7,119,084,660	\$5,777,339,089
Category 4	148,567 31.0%	114,705 77.2% built	\$4,847,311,189	\$6,763,223,264	\$11,509,123,619	\$9,262,538,399
Category 5	162,657 33.9%	125,226 77.0% built	\$5,325,164,065	\$7,764,980,964	\$12,968,527,898	\$10,503,169,298

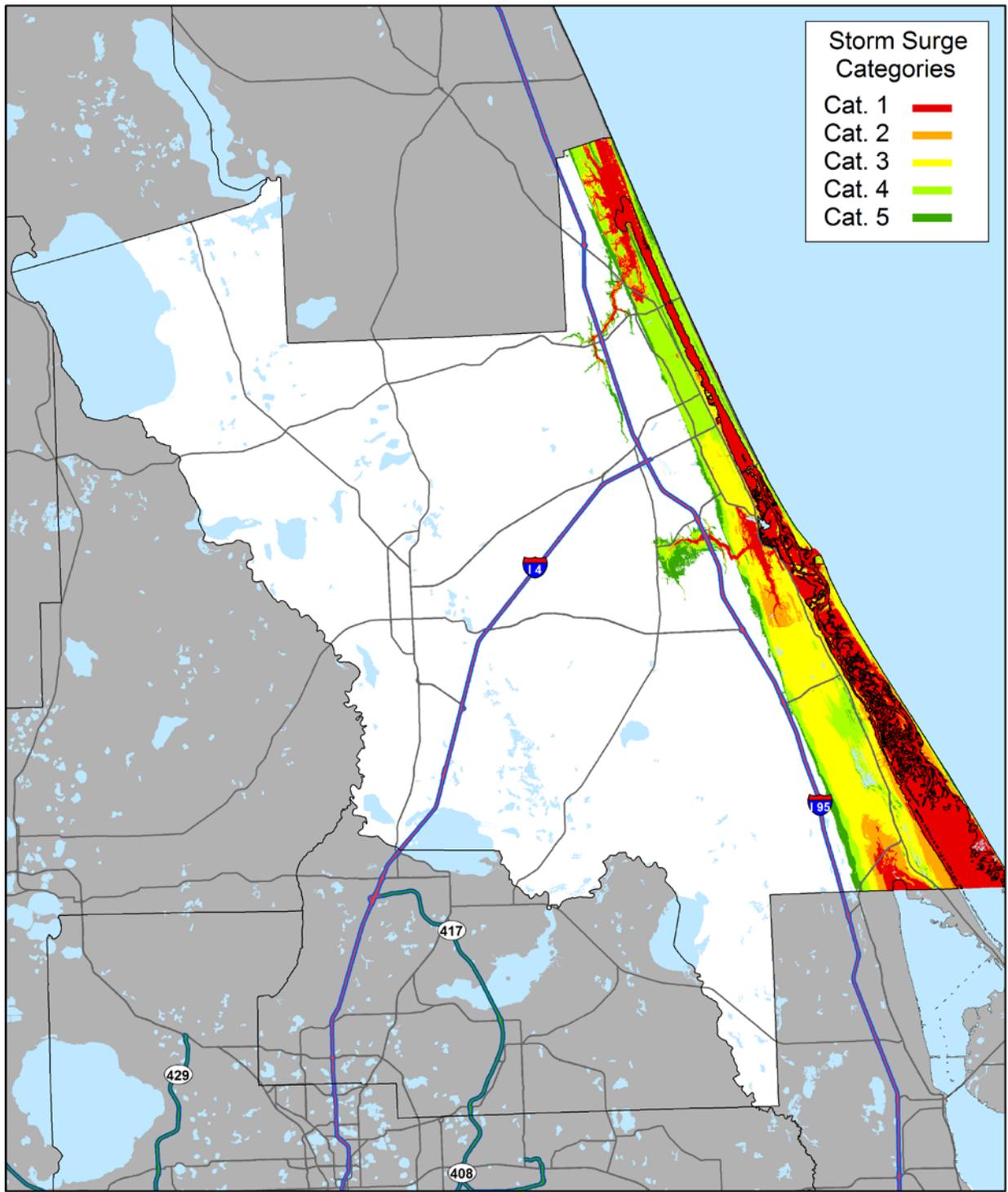
Build-Year Summary of Built Parcels within Hazard Zones – Build Year Breakdown by Hazard Zone						
Hazard Zone	Built Parcels	Built Pre-1970	Built 1970-1979	Built 1980-1989	Built 1990-1999	Built 2000-2014
Category 1	7,235	2,416 33.4% of built	1,369 18.9% of built	1,504 20.8% of built	902 12.5% of built	1,044 14.4% of built
Category 2	16,406	5,711 34.8% of built	3,049 18.6% of built	3,394 20.7% of built	1,996 12.2% of built	2,156 13.1% of built
Category 3	64,163	18,955 29.5% of built	12,572 19.6% of built	15,869 24.7% of built	8,222 12.8% of built	8,445 13.2% of built
Category 4	114,705	45,837 40.0% of built	20,198 17.6% of built	24,215 21.1% of built	11,784 10.3% of built	12,571 11.0% of built
Category 5	125,226	48,145 38.4% of built	21,724 17.3% of built	26,993 21.6% of built	14,210 11.3% of built	14,084 11.2% of built

Land Use Summary of Parcels within Hazard Zones – Number of Parcels Per Land Use						
Hazard Zone	Low Density Residential	Med/Hi. Density Residential	Commercial and Office	Industrial	Institutional	Agricultural
Category 1	7,621	605	425	27	2,875	65
Category 2	16,492	1,339	1,819	128	4,107	273
Category 3	62,328	3,623	7,017	1,246	7,772	2,215
Category 4	106,271	6,689	14,435	3,031	11,646	2,638
Category 5	117,463	7,425	15,006	3,102	12,135	3,479

Source: SLOSH, Volusia County GIS (2014)

Note: All Storm Surge Zones are cumulative (ex: Category 3 zone includes Zone 1, Zone 2 and Zone 3 parcels)

FIGURE 6.13: Storm Surge Zones by Category



Source: SLOSH

## SECTION 6: VULNERABILITY ASSESSMENT

### **Qualitative Assessment of Storm Surge Vulnerability**

As shown in Figure 6.13 on the previous page of this report, the eastern portion of Volusia County is susceptible to storm surge conditions. In the worst case scenario (a Category 5 Hurricane), the storm surge would be seen almost as far inland as Interstate 95. Western Volusia County is not susceptible to storm surge risk.

The eastern portion of the county contains single and multi-family housing, businesses, restaurants, hotels, tourist attractions, cemeteries, along with critical facilities and utility and transportation infrastructure that is vulnerable to storm surge.

Spruce Creek, located in central Volusia County, connects to Ponce Inlet and the Intracoastal Waterway and could possibly incur storm surge inundation to properties west of Interstate 95. Similar to this situation, the Tomoka River, located in northern Volusia County, could cause inundation to lands west of Interstate 95 in the Daytona Beach, Holly Hill and Ormond Beach areas.

Critical facilities, businesses and homes can expect to see losses due to storm surge damage that would be comparable in nature to losses due to flooding. Water entering homes can have devastating impacts on personal property (including expensive equipment in critical facilities) and can also cause loss of life. Depending on the elevation of a structure, storm surge can also affect beachfront parcels with damage comparable to that seen with coastal erosion. Lot foundations can be compromised in these situations, creating an incredibly unstable situation and the possibility for loss of life.

A total of 157 'core' critical facilities are located within the storm surge hazard zones, or 38.7% of all critical facilities countywide. The critical facilities at highest risk for damage include those located east of the Intracoastal Waterway or those located in close proximity to the Spruce Creek or Tomoka River. There are fire stations and city halls located on the barrier island in Ponce Inlet and Daytona Beach Shores that must be evacuated and are susceptible to storm surge. The county's Lifeguard Headquarters and Administration Building is located on the beach in Daytona Beach and provides public safety and lifeguard duties to all the beach area. Daytona Beach Fire Department has a fire station on Beach Street directly on the Halifax River which is susceptible. All low-rise bridges along the Halifax Intracoastal River would be susceptible to storm surge including Highbridge, Main Street, Silver Beach, and the North Bridge in New Smyrna Beach while the bases of the 4 high rise bridges could also be at risk. The Ponce Inlet Lighthouse is at risk and has had extensive work done around by the US Army Corps of Engineers to re-nourish the sand and install rock jetties in the inlet area. Beach renourishment was also completed after the 2004 hurricane season all along New Smyrna Beach from a spoil island in the Halifax Intracoastal River. There are two piers with restaurants that are susceptible to storm surge with Joe's Crab Shack on the Main Street Pier being a major tourist draw to the Boardwalk Entertainment Area of Daytona Beach.

On a parcel basis, 33.9% of the parcels within the county are located within a Storm Surge Zone, representing nearly \$13 billion in real estate value. If a category 5 storm were to hit the county – based on these figures – total losses to the county could surpass one billion. This zone represents 125,226 built structures, 38.4% of which were built before 1970. The disproportionately older stock of buildings heightens the risk for storm surge-induced damage in Volusia County. The impact on the tourism industry would be significant throughout the county.

## GEOLOGIC HAZARDS

## 6.14 SINKHOLE

Based on historic incidents, the unincorporated areas of Volusia County have been vulnerable to sinkhole hazards, with 78 occurring in the study region between 1973 and 2005. Per the *Hazards Profiles* section, most of the county is at a low to very low risk from sinkholes. However, there is an area within the unincorporated western part of the county that is at medium risk to sinkhole hazards. FDEP data was used to determine the number of people and improved properties that are susceptible to sinkhole hazards. Sinkholes are quite rare from a national perspective, and the East Central Florida Region and Volusia County are at a much higher risk than most other areas of the country. These occur in Florida largely due to the presence of limestone and water beneath Florida's surface, which can sometimes create a vacuum effect and envelope entire structures and plots of land. All structures, utilities, systems and populations are equally vulnerable.

The table below depicts the types of sinkholes. All three of these sinkhole types are common in Florida.

**FIGURE 6.14: Sink Hole Types**

Sinkhole Types	
Category	Criteria
Collapse Sinkholes	Collapse sinkholes are the most dramatic of the three sinkhole types; they form with little warning and leave behind a deep, steeply sided hole. Collapse occurs because of the weakening of the rock of the aquifer by erosion and is often triggered by changes in water levels in the Floridan aquifer.
Subsidence Sinkholes	The progression of a subsidence sinkhole is shown below. Rainwater percolates through overlying sediments and reaches the limestone, dissolving the rock and gradually weakening its structural integrity. Gradually subsiding sinkholes commonly form where slow dissolution takes place, mostly along joints in the limestone. These sinkholes tend to form naturally and are not greatly affected by human activities.
Solution Sinkholes	Solution sinkholes form where the overburden is absent and the limestone is exposed at land surface. This type of sinkhole usually forms as a bowl-shaped depression with the slope of its sides determined by the rate of subsidence relative to the rate of erosion of the walls of the depression from surface runoff. Surface runoff may also carry sand and clay particles into the depression, which may form a relatively impermeable seal in the bottom. A marsh or lake forms when water is ponded because infiltration is restricted by the clayey seal. The gently rolling hills and shallow depressions typical of solution-subsidence topography are common over large parts of Florida

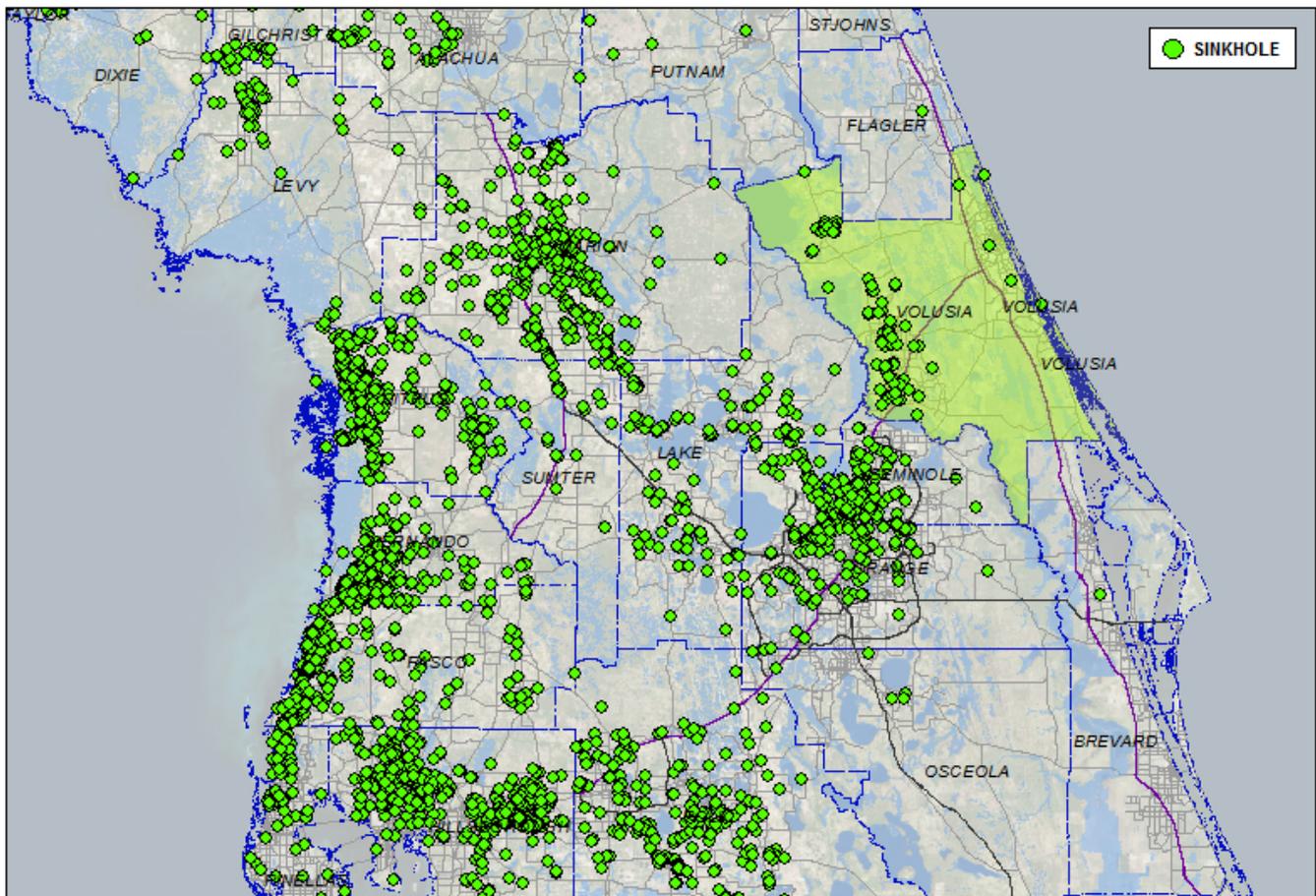
## SECTION 6: VULNERABILITY ASSESSMENT

### Qualitative Assessment of Sinkhole Vulnerability

The following map depicts sustenance reports in Florida that have been reported to the Florida Department of Environmental protection. This data is relevant for the state of Florida as of October 24, 2014 and depicts the statewide scale as opposed to the county scale for a reference of where Volusia County stands from a regional-risk perspective. It is important to note that Florida is at heightened risk for sinkholes relative to other areas of North America.

From a spatial risk perspective, the map below clearly shows that the western and southwestern portions of Volusia County are at a heightened risk for sinkholes and sustenance issues. The communities of DeBary, DeLand, Deltona, Orange City, Lake Helen, Stone Island and DeLeon Springs are specifically at heightened risk. Agricultural use of water impacts the risk of sinkholes by depleting the underground source of water. No particular population is at more risk than others from sinkholes. Critical infrastructure at risk in this area includes Florida Hospital in Orange City and DeLand. Interstate 4 through the west side of the county is at risk as well as Howland Blvd in Deltona are main thoroughfares and evacuation routes. Sinkholes can have completely devastating effects on homes, businesses and critical facilities, often resulting in the complete loss of the structure. In contrast to hazards such as tornadoes that strike quickly and can completely destroy structures, sink holes tend to develop slowly and grow over time. Thus, loss of personal property (or non-fixtured property) can be greatly reduced in the event of a sinkhole. However, sinkholes can open suddenly, which can cause loss of life and personal property.

### **SINKHOLE LOCATIONS - CENTRAL FLORIDA (OCTOBER 2014)**



Source: Florida Department of Environmental Protection (October 2014)

## SECTION 6: VULNERABILITY ASSESSMENT

### 6.15 TSUNAMI

Although, historically there have been no occurrences of tsunamis in Volusia County, the potential exists. The likelihood is low, but the consequences would be catastrophic. The worst case scenario for Volusia County would be a 3-foot wave that could reach as far as 300 feet inland, meaning that properties and populations within this zone would be affected more severely.

**Table 6.17** lists the number of people and properties, the percentage of properties and the property values that are located in the tsunami inundation zone, based on Volusia County GIS data. There were several gaps in the data that excluded the barrier islands along the shoreline. These areas appeared to be susceptible to tsunami inundation and/or potential uninhabitability due to infrastructure loss in low lying areas. To be conservative, the analysis was performed by accounting for these barrier island areas as well.

**TABLE 6.18: Volusia County Improved Property at Risk to Tsunami**

JURISDICTION	Number of People at Risk	Number of Improved Parcels at Risk	Percentage of Improved Parcels at Risk	Value of Improved Parcels at Risk
Daytona Beach	45,910	12,841	68.46%	1,678,914,461
Daytona B. Shores	4,343	536	100.00%	108,379,184
DeBary	0	0	0.00%	0
DeLand	0	0	0.00%	0
Deltona	0	0	0.00%	0
Edgewater	0	0	0	0
Holly Hill	0	0	0	0
Lake Helen	0	0	0.00%	0
New Smyrna Beach	20,791	10,110	91.30%	1,253,431,731
Oak Hill	0	0	0	0
Orange City	0	0	0.00%	0
Ormond Beach	28,559	11,384	73.30%	1,545,623,219
Pierson	0	0	0.00%	0
Ponce Inlet	2,513	1,102	100.00%	169,838,467
Port Orange	30,218	11,397	55.80%	1,131,602,766
South Daytona	0	0	0	481,675,529
Unincorporated	29,382	14,132	30.87%	1,347,435,508
<b>TOTAL</b>	<b>131,826</b>	<b>61,502</b>	<b>43.21%</b>	

Source: Volusia County GIS Department

## SECTION 6: VULNERABILITY ASSESSMENT

### **Qualitative Assessment of Tsunami Vulnerability**

Table 6.18 on the previous page shows that a large portion of beachside Volusia County's population is at risk of being effected by a tsunami. While these events are extremely rare, it is important to note that more than 131,000 individuals would be at risk for this type of hazard.

Tsunamis can cause incredible loss of life and often strike without warning in the developing world. However, Volusia County would more than likely have a public warning announced and have several hours notice. However, even in lieu of a warning, evacuation of citizens located to the east of the Intracoastal Waterway could be a tough endeavor due to the lack of transportation infrastructure connecting it to the west of the waterway. Warning signs of an impending tsunami include a retreating shoreline or large, visible waves offshore, which could increase the number of casualties as a result of human intrigue. The large tourist presence in Volusia County is another compounding risk element that must be dealt with, as these individuals are less likely to know how to react to such an event.

Daytona Beach, Port Orange, New Smyrna Beach and Ormond Beach have the highest risk of loss in the future as a result of a tsunami, while the western portion of the county has no risk. The most-likely scenario for a tsunami in Volusia County would be triggered by a seismic event in Puerto Rico or off of the western coast of Africa. Such events can effect populations thousands of miles away.

## OTHER HAZARDS

## 6.16 WILDFIRE

Volusia County is uniformly exposed to wildfire risk, especially during the hot dry summer months and drought conditions. HAZUS data was used to determine the number of people and improved properties that are susceptible to medium and high wildfire risk. The HAZUS wildfire potential risk map accounts for the mode of fuel types to determine the risk category. Each fuel model was assigned a code (i.e. “low”, “medium”, or “high”) based on the fires spreading potential during a climatologically “dry” year. The fuel models indicate the ability of a fire to start and spread in the given terrain type, and are used as the input to the Fire Potential Index as well as fire spreading models. Wildfires in Volusia County and most of its municipality’s impact wooded areas with low population density but do pose more of a risk to rural areas. Wildfires generally do not pose high risks to large population centers. Fires can have devastating effects on structures and can cause injuries and death due to smoke inhalation. Buildings, infrastructure, critical facilities and housing for vulnerable populations have some impact by wildfires.

**Table 6.18** lists the number of people and properties, the percentage of properties and the property values that are located in the medium and high risk wildfire zones as examined in the 2009 LMS update. **Table 6.19** depicts exposure to different fire hazard zones utilizing 2014 parcel data.

<b>TABLE 6.19: Volusia County Improved Property at Risk to Wildfire</b>				
<b>JURISDICTION</b>	<b>Number of People at Risk</b>	<b># of Improved Parcels at Risk</b>	<b>% of Improved Parcels at Risk</b>	<b>Value of Improved Parcels at Risk</b>
Daytona Beach	7,785	2,879	15.35%	367,774,772
Daytona B. Shores	0	1	0.19%	1,037,664
DeBary	5,998	3,739	44.72%	276,138,817
DeLand	3,819	2,383	27.78%	168,960,593
Deltona	15,003	6,487	19.52%	307,332,505
Edgewater	2,361	1,264	13.51%	76,200,531
Holly Hill	1,382	597	13.16%	48,418,783
Lake Helen	1,149	333	30.30%	22,918,827
New Smyrna Beach	4,671	2,939	26.54%	286,927,290
Oak Hill	916	397	44.71%	17,313,018
Orange City	1,305	419	15.72%	81,685,892
Ormond Beach	10,797	4,861	31.30%	470,274,680
Pierson	2,231	361	61.19%	17,946,371
Ponce Inlet	391	355	32.21%	53,468,430
Port Orange	9,931	5,554	27.19%	434,378,041
South Daytona	1,726	643	14.12%	44,228,607
Unincorporated	39,995	18,659	40.76%	1,492,034,741
<b>TOTAL</b>	<b>109,460</b>	<b>51,871</b>	<b>27.73%</b>	<b>\$4,167,039,562</b>

Source: Volusia County GIS Department

## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.19: 2014 Parcel Exposure to Fire Hazard Zones**

Financial Exposure to Hazard Zones – Cumulative Financial Values within Zones						
Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Very High Risk	181,765 37.9%	148,435 81.7% built	\$3,420,986,873	\$8,734,441,264	\$12,099,510,627	\$9,227,154,947
High Risk	119,969 25.0%	61,030 50.9% built	\$2,375,255,315	\$4,746,786,603	\$6,901,417,348	\$5,619,673,598
Low Risk	176,597 36.8%	84,584 47.9% built	\$4,509,917,051	\$5,816,809,845	\$9,878,681,106	\$7,461,503,764

Build-Year Summary of Built Parcels within Hazard Zones – Build Year Breakdown by Hazard Zone						
Hazard Zone	Built Parcels	Built Pre-1970	Built 1970-1979	Built 1980-1989	Built 1990-1999	Built 2000-2014
Very High Risk	148,435	40,707 27.4% of built	25,801 17.4% of built	41,542 28.0% of built	20,129 13.6% of built	20,256 13.6% of built
High Risk	61,030	6,900 11.3% of built	5,852 9.6% of built	13,791 22.6% of built	14,033 23.0% of built	20,454 33.5% of built
Low Risk	84,584	37,362 44.2% of built	12,857 15.2% of built	12,882 15.2% of built	7,275 8.6% of built	14,208 16.8% of built

Land Use Summary of Parcels within Hazard Zones – Number of Parcels Per Land Use						
Hazard Zone	Low Density Residential	Med/Hi. Density Residential	Commercial and Office	Industrial	Institutional	Agricultural
Very High Risk	150,843	4,757	10,978	2,093	8,887	1,537
High Risk	85,812	2,890	6,615	1,636	4,928	10,841
Low Risk	104,291	5,751	13,580	3,738	21,593	23,767

Source: HAZUS-MH, Volusia County GIS (2014)

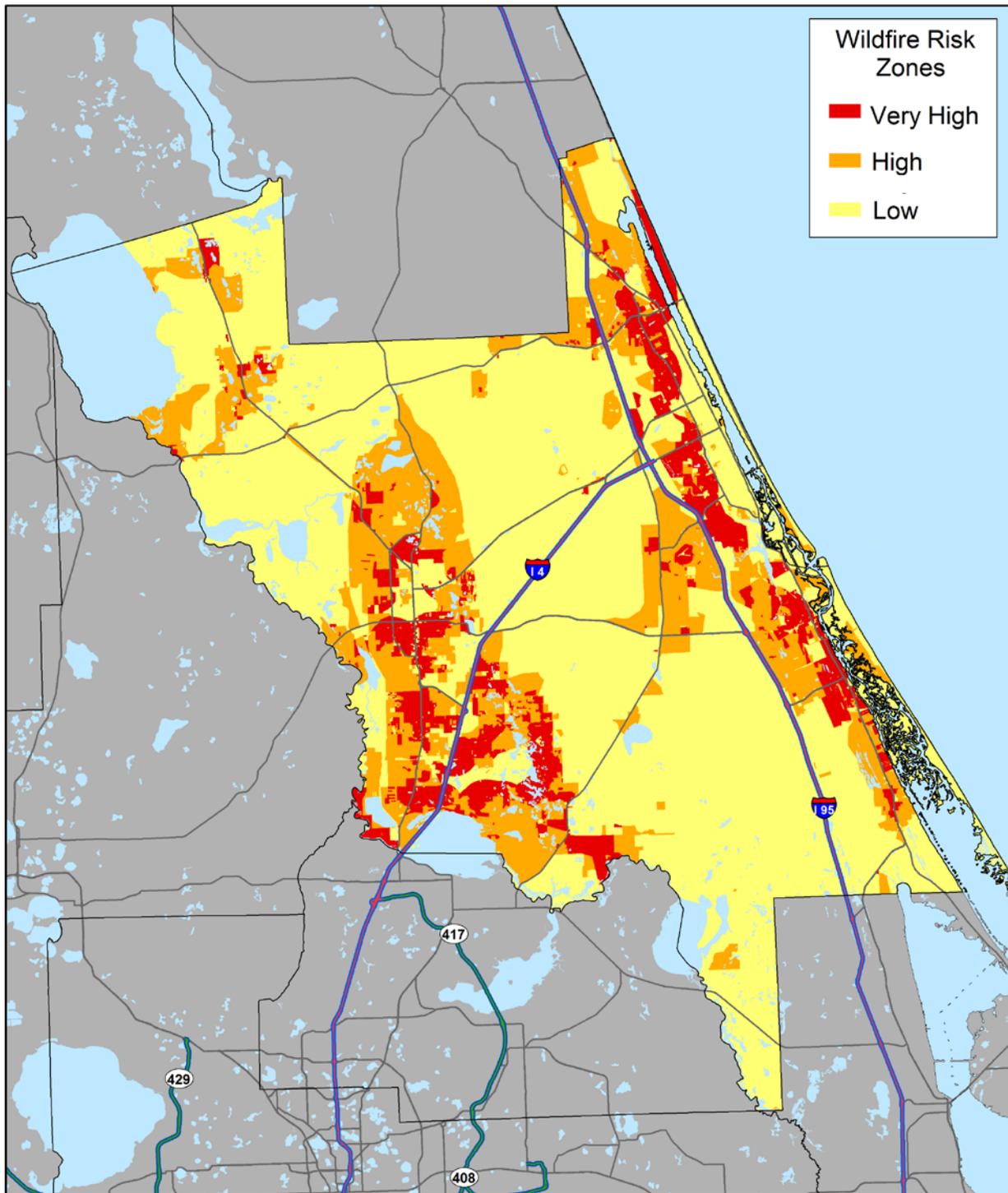
The table shown below depicts the different types of fire warnings that have been identified by the National Weather Service (NWS).

**FIGURE 6.15: Fire Advisory Types**

Alert	Criteria
Fire Weather Watch	Conditions are favorable for red flag conditions in and close to the watch area in the next 12 to 48 hours.
Red Flag Warning	Issued for weather events which may result in extreme fire behavior that will occur within 24 hours. Red Flag criteria occurs whenever a geographical area has been in a dry spell for a week or two, or for a shorter period, and the National Fire Danger Rating System (NFDRS) is high to extreme and if there is a sustained wind average 15 mph or greater, a relative humidity less than or equal to 25 percent, and a temperature of greater than 75 degrees F.

Source: National Weather Service

FIGURE 6.16: Fire Hazard Zones



Source: HAZUS-MH

## SECTION 6: VULNERABILITY ASSESSMENT

### **Qualitative Assessment of Fire/Wildfire Vulnerability**

Table 6.19 shows that a large portion of Volusia County is susceptible to fires. 37.9% of parcels within the county are located within the 'Very High Risk' zone, accounting for a total of 148,435 structures. An additional 25% of the parcels within the county are located within the 'High Risk' zone, accounting for a total of 61,030 additional structures that are threatened by fire. Cumulatively, approximately 19 billion dollars in property value is susceptible (or at risk to) fires within the county.

The build year of a parcel is extremely important (perhaps the most important) metric to look at when analyzing risk as a result of fires. This is due to the adoption of building codes over time. Building codes can limit the types of materials utilized on buildings, along with other mitigating strategies, therefore reducing the risk for newer structures within the county. While the county has an older building stock, the parcels that are at risk for fire within the county are generally newer as compared to the parcels vulnerable to other hazards. Of the parcels within the 'Very High Risk' zone, 27.4% were built prior to 1970, while only 11.3% of the parcels within the 'High Risk' zone were built before 1970. The Ormond Beach rural area along SR 40 west of I-95 is a very susceptible area with many heavily wooded single family subdivisions such as Timber Creek, Hunters Ridge, Breakaway Trails, and Plantation Pines.

In terms of land use, the majority of the parcels within the fire hazard zones are low density residential. More than 236,000 low density residential parcels are located within the 'High' and 'Very High' risk zones. More than 15,000 businesses are located within the 'High' and 'Very High' risk zones.

In addition to structures susceptible to fire, many areas of Volusia County are agricultural, while there are also many wood lands within the county. These areas are extremely susceptible to wildfires. Wildfires can spread in two ways: Burning ashes from tree lines can 'jump' across roadways or other barriers, widening the scope of the fire event. The second method of wildfire spread is less visible, as wildfires have the ability to transfer energy underground, making for an invisible spread of the wildfire. Often times, the fire does not have to be actively 'burning' for a spread to occur. This incredibly heightens the risk for residents living in isolated rural areas surrounded by trees.

6.17 SEA LEVEL RISE

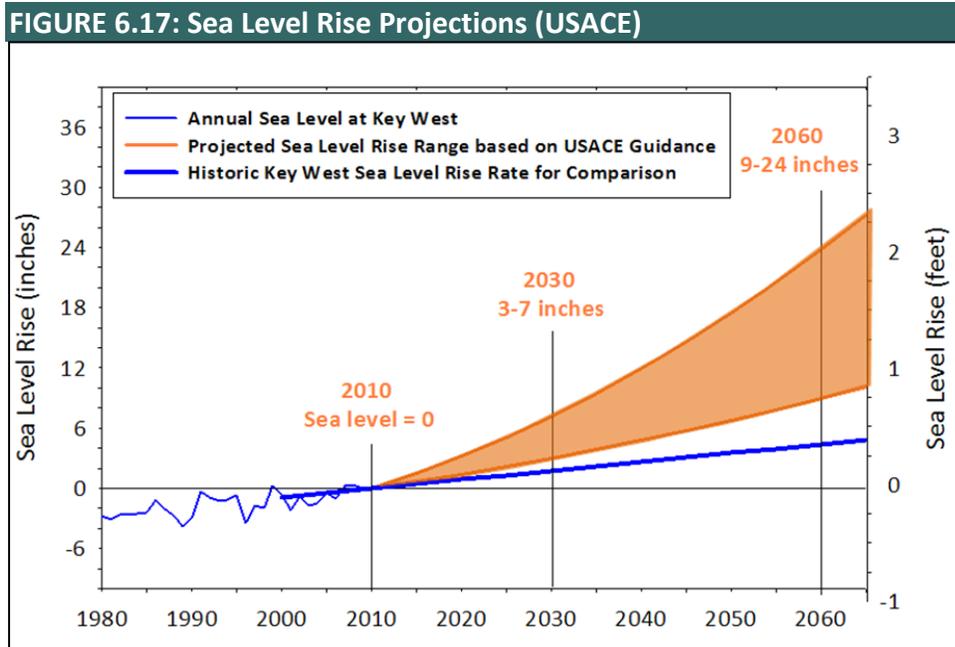
Sea level rise, caused by changes in the Earth’s climate, is a phenomenon resulting from a consistent change in the Earth’s surface temperature that leads to changes in climatic patterns which ultimately alters weather patterns - including atmospheric and hydrologic impacts – and leads to sea level rise.

The greatest impacts from climate change on sea level rise include storm surge and coastal flooding. Sea level rise and climate change also affect atmospheric and hydrologic patterns which in turn impact other hazards like inland flood (increased rainfall periods), drought (decreased rainfall periods), and wildfire (exacerbated by vegetative fuel growth in periods of higher rainfall and then burn risk in drier periods). During the last century, sea level has risen approximately 6-9 inches worldwide and 9 inches along the coast of East Central Florida.

The United States Environmental Protection Agency (EPA) has been analyzing the causes, effects and possible responses to sea level rise. EPA’s 1995 report, *The Probability of Sea Level Rise*, estimates that if humanity continues to emit greenhouse gases into the atmosphere, mean sea level could raise 1-2 feet in the next century and 5 feet over the next 150-300 years. At this time, no studies have been conducted in Volusia County to determine the short and long term impacts of sea level rise.

**Table 6.20** on the following page depicts countywide exposure to sea level rise levels of 11 inches, 25 inches and 36 inches, the time-specific implications of which can be determined by a corollary study. These values were available from FDOT and are the closest simulations publicly available for approximate one-foot, two-foot and three-foot rises in sea level. The rises are measured from Mean Sea Level (MSL).

The graph below depicts sea level rise projections from the US Army Corps of engineers for Key West, Florida. The projected sea level rise scenarios depicted below can be utilized alongside the 11, 25 and 36-inch models to determine a specific time frame appropriate for each inundation level. Since these curves are not projections for Volusia County, so these values should be treated as approximate values.



## SECTION 6: VULNERABILITY ASSESSMENT

**TABLE 6.21: 2014 Parcel Exposure to Sea Level Rise Inundation Levels**

Financial Exposure to Hazard Zones – Cumulative Financial Values within Zones						
Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
11-inch Rise	3,220 0.7%	1,065 33.1% built	\$913,089,265	\$407,361,986	\$1,277,130,324	\$887,542,509
25-inch Rise	5,189 1.1%	1,982 38.2% built	\$1,270,498,095	\$612,375,733	\$1,814,731,544	\$1,345,070,187
36-inch Rise	8,252 1.7%	3,840 46.5% built	\$1,522,869,642	\$846,684,371	\$2,290,982,515	\$1,729,456,677

Build-Year Summary of Built Parcels within Hazard Zones – Build Year Breakdown by Hazard Zone						
Hazard Zone	Built Parcels	Built Pre-1970	Built 1970-1979	Built 1980-1989	Built 1990-1999	Built 2000-2014
11-inch Rise	1,065	458 43.0% of built	177 16.6% of built	147 13.8% of built	133 12.5% of built	150 14.1% of built
25-inch Rise	1,982	894 45.1% of built	292 14.7% of built	280 14.1% of built	260 13.1% of built	256 12.9% of built
36-inch Rise	3,840	1,901 49.5% of built	610 15.9% of built	518 13.5% of built	392 10.2% of built	419 10.9% of built

Land Use Summary of Parcels within Hazard Zones – Number of Parcels Per Land Use						
Hazard Zone	Low Density Residential	Med/Hi. Density Residential	Commercial and Office	Industrial	Institutional	Agricultural
11-inch Rise	1,173	58	73	6	1,612	79
25-inch Rise	2,239	154	225	18	2,047	156
36-inch Rise	3,763	390	791	138	2,408	281

Source: FDOT Sketch Tool (USACE), Volusia County GIS (2014)

### Qualitative Assessment of Sea Level Rise Vulnerability

Sea level rise is currently being studied as a threat to properties located near oceans, and many areas of eastern Volusia County would be inundated with water if sea level rise occurs as modeled by the U.S. Army Corps of Engineers. For this study, an 11 inch, 25 inch and 36 inch rise were utilized to study the amount of property value, the types of properties and build-year of properties located in each inundation zone. No years (or time tables) were associated with these metrics due to varying approximations by a number of scientists in the field. However, these figures accurately represent the inundation levels if they were to occur.

As is the case with other hazards, low density residential parcels are among the most vulnerable to sea level rise within Volusia County. In the event of an 11-inch rise, which is somewhat moderate by many projections, more than 1,000 residential units would be partially inundated in water. Institutional structures are also at high risk to the effects of sea level rise.

### 6.18 CONCLUSIONS ON HAZARD VULNERABILITY

The results of this vulnerability assessment are useful in at least three ways:

- Improving our understanding of the risk associated with the natural hazards in Volusia County through better understanding of the complexities and dynamics of risk, how levels of risk can be measured and compared, and the myriad of factors that influence risk. An understanding of these relationships is critical in making balanced and informed decisions on managing risk.
- Providing a baseline for policy development and comparison of mitigation alternatives. The data used for this analysis presents a current profile of risk in Volusia County. Future updates will enable comparison of the changes in risk over time. Baselines of this type can support the objective analysis of policy and program options for risk reduction in the region.
- Comparing the risk among the natural hazards addressed. The ability to quantify the risk to all these hazards relative to one another helps in a balanced, multi-hazard approach to risk management at each level of governing authority. This ranking provides a systematic framework to compare and prioritize the very disparate natural hazards that are present in Volusia County. This final step in the risk assessment provides the necessary information for local officials to craft a mitigation strategy to focus resources on only those hazards that pose the most threat to the county.

## SECTION 7 – CAPABILITY ASSESSMENT

This section of the Plan discusses the capability of Volusia County and the participating municipal jurisdictions to implement hazard mitigation activities. It consists of the following four subsections:

- ▶ **What is a Capability Assessment?**
- ▶ **Conducting the Capability Assessment**
- ▶ **Capability Assessment Findings**
- ▶ **Conclusions of the Capability Assessment**

### 7.1 WHAT IS A CAPABILITY ASSESSMENT?

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The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects.<sup>1</sup> As in any planning process, it is important to try to establish which goals, objectives and/or actions are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time, given a local government’s planning and regulatory framework. This capability assessment also highlights the positive mitigation measures already in place, or being implemented at the local government level, which should continue to be supported and enhanced through future mitigation efforts.

The capability assessment completed for Volusia County and its jurisdictions serves as a critical planning step and an integral part of the foundation for designing an effective multi-jurisdictional hazard mitigation strategy. Coupled with the *Risk Assessment*, the *Capability Assessment* helps identify and target meaningful mitigation actions for incorporation in the *Mitigation Strategy* portion of the Hazard Mitigation Plan. It helps establish the goals and objectives for the Volusia County Region to pursue under this Plan and ensures that those goals and objectives are realistically achievable under given local conditions.

### 7.2 CONDUCTING THE CAPABILITY ASSESSMENT

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In order to facilitate the inventory and analysis of local government capabilities throughout Volusia County, a detailed *Capability Assessment Survey*<sup>2</sup> was distributed to Volusia County staff and to staff from participating local municipal jurisdictions. The survey questionnaire, which was completed by

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<sup>1</sup> While the Interim Final Rule for implementing the Disaster Mitigation Act of 2000 does not require a local capability assessment to be completed for local hazard mitigation plans, it is a critical step to develop a mitigation strategy that meets the needs of each jurisdiction while taking into account their own unique abilities. The Rule does state that a community’s mitigation strategy should be “based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools” (44 CFR, Part 201.6(c)(3)).

<sup>2</sup> The *Capability Assessment Survey* instrument used to assess county and municipal capabilities is available through Volusia County upon request.

## SECTION 7: CAPABILITY ASSESSMENT

applicable local government officials, requested information on a variety of “capability indicators” such as existing local plans, policies, programs or ordinances that contribute to and/or hinder the community’s ability to implement hazard mitigation actions.

At a minimum these survey results provide an inventory of existing local plans, ordinances, programs and resources in place or under development in addition to their overall effect on hazard loss reduction. The survey instrument thereby not only helps accurately assess each jurisdiction’s degree of local capability, but also serves as a good source of introspection for those jurisdictions wishing to improve their capability. The identification of opportunities and specific actions to be proposed as part of the community’s mitigation strategy often develop as an outcome of completing a capability assessment.

### 7.3 CAPABILITY ASSESSMENT FINDINGS

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The findings of the capability assessment are summarized in this Plan to provide insight into the capacity of Volusia County and the participating jurisdictions to implement hazard mitigation activities. All information is based upon the responses provided by local government officials to the *Capability Assessment Survey*.

#### 7.3.1 Planning and Regulatory Capability

Planning and regulatory capability is based on the implementation of plans, ordinances and programs that demonstrate a local jurisdiction’s commitment to guiding and managing growth, development and redevelopment in a responsible manner while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning and transportation planning in addition to the enforcement zoning or subdivision ordinances and building codes that regulate how land is developed and structures are built, as well as protecting environmental, historic and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools or programs in place or under development for Volusia County and the participating jurisdictions, along with their potential effect on loss reduction. This information will help identify opportunities to address existing gaps, weaknesses or conflicts with other initiatives in addition to integrating the implementation of this Plan with existing planning mechanisms, where appropriate.

**Table 7.1** provides a summary of the relevant local plans, ordinances and programs already in place or under development for Volusia County and the participating jurisdictions. An (x) mark indicates that the given item is currently in place and being implemented by the local jurisdiction, or that it is currently being developed for future implementation. A more detailed discussion on each jurisdiction’s planning and regulatory capability follows, along with the incorporation of additional information based on the narrative comments provided by local officials in response to the survey questionnaire.

Following the inventory of local plans, programs and policies is a description of each element upon which the local jurisdiction’s capability score was based.

## SECTION 7: CAPABILITY ASSESSMENT

**TABLE 7.1: Relevant Plans, Ordinances and Programs**

JURISDICTION	Local Mitigation Strategy	Comprehensive Land Use Plan	Floodplain Management Plan	Open Space Management Plan	Stormwater Management Plan	Natural Resource Protection Plan	Flood Response Plan	Emergency Operations Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Plan	Historic Preservation Plan	Floodplain Ordinance (or Flood Damage Prevention Ordinance)	Zoning Ordinance	Subdivision Ordinance	Unified Development Ordinance	Post-disaster Redevelopment / Reconstruction Ordinance	Building Code	Fire Code	National Flood Insurance Program	NFIP Community Rating System
Daytona Beach	X	X	X	X	X			X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Daytona Beach Shores	X	X	X		X			X		X		X			X	X		X		X	X	X	X
DeBary	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X			X	X	X	
DeLand	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deltona	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X			X	X	X	X
Edgewater	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Holly Hill	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X			X	X	X	X
Lake Helen	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X	
New Smyrna Beach	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oak Hill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Orange City	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	
Ormond Beach	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pierson	X	X	X					X		X		X				X	X			X	X	X	
Ponce Inlet	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Port Orange	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X
South Daytona	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X			X	X	X	X
Volusia County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

### 7.3.2 Emergency Management

Hazard mitigation is widely recognized as one of the four primary phases of emergency management. Other phases include preparedness, response and recovery. In reality, each phase is interconnected with hazard mitigation as **Figure 7.1** suggests. Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions. As a result, the *Capability Assessment Survey* asked several questions regarding emergency management plans in order to assess the jurisdiction's willingness to plan and their level of technical planning proficiency.

**FIGURE 7.1: The Four Phases of Emergency Management**



**Local Mitigation Strategy (LMS):** Also called a hazard mitigation plan, the local mitigation strategy represents a community's blueprint for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. The essential elements of a local mitigation strategy include a risk assessment, capability assessment, mitigation strategy and the mitigation projects list.

- Volusia County and its jurisdictions developed the first version of their local mitigation strategy in 1999 (adopted 2000) and updated the plan in 2009. The plan is currently undergoing a revision that will be completed in 2014)

**Disaster Recovery Plan:** A disaster recovery plan serves to guide the physical, social, environmental and economic recovery and reconstruction process following a disaster. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses.

## SECTION 7: CAPABILITY ASSESSMENT

- Survey results indicate that 12 of the jurisdictions have their own disaster recovery plan. A potential mitigation action that should be considered is for all participating jurisdictions to develop their own disaster recovery plan that would incorporate mitigation opportunities into the disaster recovery process.

**Emergency Operations Plan:** An emergency operations plan outlines responsibilities and the means by which resources are deployed to respond to an emergency or disaster. Many communities choose to update their emergency operations plan before events occur to better prepare for future disasters. This is an example of hazard mitigation.

- Volusia County Emergency Management maintains the emergency operations plan that also covers their respective jurisdictions. In general, emergency operations planning has been determined to have a moderate effect on loss reduction, as its emphasis focuses on preparedness and response operations rather than hazard mitigation activities.

**Continuity of Operation Plan:** A continuity of operations plan establishes a chain of command line of succession, and plans for backup or alternate emergency response resources in case of an extreme emergency. Developing a continuity of operation plan is an example of hazard mitigation.

- Results indicate that 15 of jurisdictions in Volusia County have a continuity of operations plan in place. Each of the other jurisdictions is encouraged to consider preparing their own continuity of operations plans as a possible mitigation action for inclusion this Plan.

### 7.3.3 General Planning

The implementation of hazard mitigation activities should involve agencies and individuals beyond the emergency management profession. Other stakeholders may include local planners, public works officials, economic development specialists and others. Because in many instances, concurrent local planning efforts help achieve or complement hazard mitigation goals, even though they are not specifically designed as such, the *Capability Assessment Survey* asked questions regarding each jurisdiction's general planning capabilities and the degree to which hazard mitigation is integrated into other ongoing planning efforts.

**Comprehensive Land Use Plan:** A comprehensive land use plan establishes the overall vision for a community, and serves as a guide for future governmental decision making. Typically a comprehensive plan is comprised of a summary of current and expected demographic conditions, land use, transportation elements and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can greatly enhance the likelihood of achieving risk reduction goals, objectives and actions.

- All jurisdictions within the region have a comprehensive land use plan as required by state law.

**Capital Improvements Plan:** A capital improvements plan guides the scheduling of spending for public improvement projects. A capital improvements plan can serve as an important mechanism to guide

## SECTION 7: CAPABILITY ASSESSMENT

future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

- Volusia County has a Capital Improvements Element (CIE) that is part of the Comprehensive Plan. The Capital Improvement Plan should be considered a local funding source for mitigation projects recommended as part of the Local Mitigation Strategy and the implementation of those actions will help to reduce disaster damages.

**Historic Preservation Plan:** A historic preservation plan is intended to preserve historic structures or districts within a community. An often overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards to include the identification of the most effective way to reduce future damages.<sup>3</sup> This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harms way.

- There are 10 jurisdictions that have a historic preservation plan.

**Zoning Ordinances:** Zoning dictates the means by which land use is controlled by a local government. As part of a community's police power, zoning is used to protect the public health, safety and welfare of those within a given jurisdiction. A zoning ordinance is the mechanism through which zoning is implemented. Since zoning regulations enable municipal governments to limit the type and density of development, it can serve as a powerful tool, especially when applied in identified hazard areas.

- All of the participating jurisdictions have a zoning ordinance.

**Subdivision Ordinances:** A subdivision ordinance is generally intended to regulate the development of housing, commercial and industrial uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.<sup>4</sup>

- There are 16 jurisdictions that have a subdivision ordinance.

**Building Codes, Permitting and Inspections:** Building Codes regulate construction standards. In many communities permits must be issued and inspections of work must take place for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

- All Volusia County jurisdictions have adopted and enforce the Florida Building Code.

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<sup>3</sup> See Protecting the Past from Natural Disasters. 1989. Nelson, Carl. National Trust for Historic Preservation: Washington D.C.

<sup>4</sup> For additional information regarding the use of subdivision regulations in reducing flood hazard risk, see Subdivision Design in Flood Hazard Areas. 1997. Morris, Marya. Planning Advisory Service Report Number 473. American Planning Association: Washington D.C.

## SECTION 7: CAPABILITY ASSESSMENT

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program developed by the Insurance Services Office, Inc. (ISO).<sup>5</sup> Under the BCEGS program, ISO assesses the building codes and enforcement of these codes in a particular community, with special emphasis on mitigation of losses from natural hazards. The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The concept behind this is that communities with well-enforced, up-to-date codes should have fewer losses, and insurance rates can reflect that in these communities.

In conducting the assessment ISO collects information related to personnel qualifications and continuing education, as well as the number of inspections performed per day. This type of information, combined with local building codes, is used to determine a grade for that jurisdiction. The grades range from 1 to 10, with the lower grade being more ideal. A BCEGS grade of 1 represents exemplary commitment to building code enforcement, and a grade of 10 indicates less than minimum recognized protection. **Table 7.2** lists the BCEGS ratings for the jurisdictions in the region.

**TABLE 7.2: BCEGS Ratings in the Region**

JURISDICTION	BCEGS RESIDENTIAL RATING	BCEGS COMMERCIAL RATING	YEAR LAST RATED
Daytona Beach	4	3	
Daytona Beach Shores			
DeBary			
DeLand			
Deltona			
Edgewater			
Holly Hill			
Lake Helen	4	4	2000
New Smyrna Beach			
Oak Hill			
Orange City			
Ormond Beach	3	3	2004
Pierson			
Ponce Inlet			
Port Orange			
South Daytona			
Volusia County			

Source: Jurisdictions

<sup>5</sup> Participation in BCEGS is voluntary and may be declined by local governments if they do not wish to have their local building codes evaluated.

### 7.3.4 Floodplain Management

Flooding represents the greatest natural hazard facing the nation. At the same time the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the *National Flood Insurance Program* (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program. It is therefore used as part of this assessment as a key indicator for measuring local capability.

In order for a county or municipality to participate in the NFIP they must adopt a local flood damage prevention ordinance which requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by a 100-year flood event, and that new development in the floodplain will not exacerbate existing flood problems or increase damage to other properties.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Once completed, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials and the private sector about the likelihood of flooding in their community.

An additional indicator of floodplain management capability is the active participation of local jurisdictions in the *Community Rating System* (CRS). The CRS is an incentive-based program that encourages counties and municipalities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP, adding extra local measures to provide protection from flooding. All of the 18 creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for an improved CRS class. Class ratings, which run from 10 to 1, are tied to flood insurance premium reductions as shown in **Table 7.3**. As class ratings improve (the lower the number the better), the percent reduction in flood insurance premiums for NFIP policyholders in that community increases.

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10. The CRS application process has been greatly simplified over the past several years, based on community comments intended to make the CRS more user friendly, and extensive technical assistance available for communities who request it.

Volusia County and its 16 jurisdictions are all participants in the National Flood Insurance Program (NFIP) and 10 jurisdictions participate in the Community Rating System (CRS). Compliance with the NFIP is maintained through:

- Jurisdiction participation in the Volusia Prepares Working Group (quarterly)
- Quarterly submittal of Mitigation Initiatives by jurisdictions
- Complying with NFIP through County/Municipal Floodplain Ordinances (exceed CFR-44)
- Compliance with Florida Building Code

## SECTION 7: CAPABILITY ASSESSMENT

**TABLE 7.3: CRS Premium Discounts, By Class**

CRS CLASS	PREMIUM REDUCTION
1	45%
2	40%
3	35%
4	30%
5	25%
6	20%
7	15%
8	10%
9	5%
10	None

Source: FEMA

**TABLE 7.4: CRS Participation in Volusia County (as of 8/6/14)**

JURISDICTION	CRS CLASSIFICATION	DISCOUNT FOR SFHA
Daytona Beach	6	20%
Daytona Beach Shores	6	20%
DeBary	NA	NA
DeLand	NA	NA
Deltona	NA	NA
Edgewater	7	15%
Holly Hill	8	5%
Lake Helen	NA	NA
New Smyrna Beach	7	15%
Oak Hill	NA	NA
Orange City	NA	NA
Ormond Beach	6	20%
Pierson	NA	NA
Ponce Inlet	5	25%
Port Orange	7	15%
South Daytona	7	15%
Volusia County	5	25%

Source: Volusia County Emergency Management and FEMA

## SECTION 7: CAPABILITY ASSESSMENT

***Floodplain Management Plan:*** A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding the corrective and preventative measures put in place to reduce flood-related impacts. Floodplain management plans are similar to hazard mitigation plans except for the fact that they focus solely on flood hazards and identifying specific actions to address flooding problems within a jurisdiction.

- All jurisdictions have a floodplain management plan, located within the County FMP.

***Stormwater Management Plan:*** A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures intended to reduce the impact of minor urban flooding. Stormwater management plans are an excellent way for local governments to regulate stormwater flow within the jurisdiction and to prevent future stormwater problems.

- There are 16 jurisdictions that have a stormwater management plan as of 2014.

## 7.4 CONCLUSIONS OF THE CAPABILITY ASSESSMENT

The capability of Volusia County and the participating jurisdictions varies greatly from jurisdiction to jurisdiction. **Table 7.5** lists the total number of jurisdictions that have plans, ordinances and programs in place or under development.

**TABLE 7.5: Relevant Plans, Ordinances and Programs**

Plan, Ordinance or Program	Total Number of Jurisdictions
Local Mitigation Strategy	17
Comprehensive Land Use Plan	17
Floodplain Management Plan	17
Open Space Management Plan	15
Stormwater Management Plan	16
Natural Resource Protection Plan	13
Flood Response Plan	13
Emergency Operations Plan	17
Continuity of Operations Plan	15
Evacuation Plan	16
Disaster Recovery Plan	12
Capital Improvements Plan	17
Economic Development Plan	13
Historic Preservation Plan	10
Floodplain Ordinance (or Flood Damage Prevention Ordinance)	17
Zoning Ordinance	17
Subdivision Ordinance	16
Unified Development Ordinance	12
Post-disaster Redevelopment / Reconstruction Ordinance	8
Building Code	17
Fire Code	17
National Flood Insurance Program	16
NFIP Community Rating System	11

The *Capability Assessment* and *Risk Assessment* serve as the foundation for a meaningful hazard mitigation strategy. During the process of identifying the goals and mitigation actions each jurisdiction

## SECTION 7: CAPABILITY ASSESSMENT

must consider not only their level of hazard risk but also their existing capability to minimize or eliminate that risk.

In jurisdictions where the overall hazard risk is considered to be high, specific mitigation actions that account for these conditions should be considered. This may include less costly actions such as minor ordinance revisions or public awareness activities. If necessary, specific capabilities may need to be improved in order to better address recurring threats. Similarly, in cases where the hazard vulnerability is low, more emphasis can be placed on actions that may impact future vulnerability, such as guiding development away from known hazard areas using various regulatory measures.

## SECTION 8 – MITIGATION STRATEGY

This section of the Plan provides the blueprint for Volusia County and the participating jurisdictions to become less vulnerable to its identified hazards. It is based on general consensus of the Volusia Prepares LMS Working Group (LMS Working Group) and the findings and conclusions of the *Capability Assessment* and *Risk Assessment*. It consists of the following five subsections:

- ▶ **Introduction**
- ▶ **Mitigation Goals**
- ▶ **Identification and Analysis of Mitigation Techniques**
- ▶ **Selection of Mitigation Techniques for Volusia County**
- ▶ **Mitigation Success Stories**
- ▶ **Plan Update Requirement**

### 8.1 INTRODUCTION

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The intent of the local Mitigation Strategy is to provide Volusia County and the participating jurisdictions with the goals that will serve as guiding principles for future mitigation policy and project administration, along with an analysis of mitigation techniques deemed available to meet those goals and reduce the impact of identified hazards. It is designed to be comprehensive, strategic and functional in nature:

- ▶ In being *comprehensive*, the development of the strategy includes a thorough review of all hazards and identifies extensive mitigation measures intended to not only reduce the future impacts of high risk hazards, but also to assist the County and participating jurisdictions achieve compatible economic, environmental and social goals.
- ▶ In being *strategic*, the development of the strategy ensures that all policies and projects proposed for implementation are consistent with pre-identified, long-term planning goals.
- ▶ In being *functional*, each proposed mitigation action is linked to established priorities and assigned to specific departments or individuals responsible for their implementation with target completion deadlines. When necessary, funding sources are identified that can be used to assist in project implementation.

The first step in designing the Mitigation Strategy includes the identification of countywide mitigation goals. Mitigation goals represent broad statements that are achieved through the implementation of more specific, action-oriented objectives. These actions include both hazard mitigation policies (such as the regulation of land in known hazard areas through a local ordinance), and hazard mitigation projects that seek to address specifically targeted hazard risks (such as the acquisition and relocation of a repetitive loss structure).

## SECTION 8: MITIGATION STRATEGY

The second step involves the identification, consideration and analysis of available mitigation measures to help achieve the identified mitigation goals. This is a long-term, continuous process, sustained through the development and maintenance of this Plan. Alternative mitigation measures will continue to be considered as future mitigation opportunities become identified, as data and technology improve, as mitigation funding becomes available, and as this Plan is maintained over time.

The third and last step in designing the Mitigation Strategy is the selection and prioritization of specific mitigation actions, referred to as Hazard Mitigation Initiatives, for Volusia County and participating jurisdictions (provided separately in Section 9: *Mitigation Action Plan*). The Mitigation Action Plan (MAP) represents an unambiguous and functional plan for action and is considered to be the most essential outcome of the mitigation planning process.

The MAP includes a prioritized listing of proposed hazard mitigation actions (policies and projects) for Volusia County and its participating jurisdictions and partners to carry out with accompanying information such as those departments or individuals assigned responsibility for their implementation, potential funding sources and an estimated target date for completion, serving as an important tool for monitoring success or progress over time. The cohesive collection of actions listed in the MAP can also serve as an easily understood menu of mitigation policies and projects for those local decision makers who want to quickly review the recommendations and proposed actions of the Hazard Mitigation Plan.

In preparing the Mitigation Action Plan for Volusia County, the LMS Working Group considered the overall hazard risk and capability to mitigate the effects of hazards as determined through the risk and capability assessment process, in addition to meeting the adopted countywide mitigation goals and unique needs of the community. Prioritizing the proposed mitigation actions was based on the following 11 factors:

- ▶ Population Benefited
- ▶ Health and Safety Considerations
- ▶ Environmental Impact
- ▶ Consistency with Other Plans and Programs
- ▶ Reduces Risk of Future Property Damage
- ▶ Supports Essential or Critical Services
- ▶ Probability of Receiving Funding for Implementation
- ▶ Feasibility of Implementation
- ▶ Community Rating System
- ▶ Repetitive Loss Mitigation
- ▶ Benefit Cost Ratio (to be conducted prior to submitting a project for grant consideration)

The mitigation initiative scoring system is provided in **Table 8.1**.

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**TABLE 8.1: Mitigation Initiative Scoring System**

Prioritization Criteria	Scoring				
<b>Population Benefited</b>	<b>4</b> - Project will benefit a multi-jurisdictional area.	<b>3</b> - Project will benefit a jurisdictional area.	<b>2</b> - Project will benefit less than 100% of a jurisdiction (i.e., neighborhood).		
<b>Health and Safety Considerations</b> *Add 1 point for projects that benefit a multi-jurisdictional area.	<b>4</b> - Project would benefit 75% or more of the population.	<b>3</b> - Project would benefit 50-74% of the population.	<b>2</b> - Project would benefit 25-49% of the population.	<b>1</b> - Project would benefit less than 25% of the population.	
<b>Environmental Impact</b>	<b>1</b> - Project improves the environment.	<b>0</b> - Risk to the environment is undetermined.	<b>(-1)</b> - Project poses risk to the environment.		
<b>Consistency with other Plans and Programs</b>	<b>4</b> - Project is incorporated into the LMS, CEMP and Comprehensive Plan, and supports the National Flood Insurance Program (i.e., for flood related projects).	<b>3</b> - Project is incorporated into at least two of these plans.	<b>2</b> - Project is incorporated into at least one of these plans.	<b>1</b> - Project is consistent with other local standards, aside from LMS, CEMP and Comprehensive Plan.	
<b>Reduces Risk of Future Property Damage</b>	<b>4</b> - Mitigates a hazard of high frequency or risk.	<b>3</b> - Mitigates a hazard of moderate frequency or risk.	<b>2</b> - Mitigates a hazard of low frequency or risk.	<b>1</b> - Mitigates a hazard of very low frequency or risk.	
<b>Supports Essential or Critical Services</b>	<b>5</b> - Project will ensure continuity of operations for essential infrastructure or services.	<b>3</b> - Project will support infrastructure or services with loss/damage history.	<b>1</b> - Project will support infrastructure or services without loss/damage history.	<b>0</b> - Project's operation will have no impact on community infrastructure or services if disrupted.	
<b>Probability of Receiving Funding for Implementation</b>	<b>4</b> - Limited funding potential exists.	<b>3</b> - Potential funding sources are other state or federal grants or similar funding sources.	<b>2</b> - Potential funding is readily available through emergency preparedness or mitigation funding sources.	<b>0</b> - Potential funding is readily available through local funding sources (e.g., budgeting, capital improvements).	
<b>Feasibility of Implementation</b>	<b>4</b> - Project would be relatively easy to implement in one year.	<b>3</b> - Project would be easy to implement in three years.	<b>2</b> - Project would be easy to implement in five years.	<b>0</b> - Project would be difficult to implement.	
<b>Community Rating System</b>	<b>4</b> - Project supports all four elements of CRS flood-related activities (public information, mapping and regulations, damage reduction and flood preparedness).	<b>3</b> - Project supports three CRS elements.	<b>2</b> - Project supports two CRS elements.	<b>1</b> - Project supports one CRS element.	<b>0</b> - Project does not support any CRS element.
<b>Repetitive Loss Mitigation</b>	<b>4</b> - Project protects 50% or more of Repetitive Loss (RL) structures.	<b>2</b> - Project protects less than 50% of RL structures.	<b>0</b> - Project does not protect a RL structure.		
<b>Benefit Cost Ratio</b>	<b>5</b> - Project has a Benefit Cost Ratio (BCR) of "1" or higher, using FEMA approved software.	<b>3</b> - Project has a BCR of less than "1" using FEMA approved software.	<b>0</b> - The BCR can not be determined.		

8.2 MITIGATION GOALS

44 CFR Requirement

**44 CFR Part 201.6(c)(3)(i):**

The mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

For the 2014 plan update, the LMS Working Group revisited the goals from the existing plan. The review ensures that the previously identified goals remain valid. As a result of this review, the LMS Working Group recommended that the existing goals (**Table 8.2**) remain the same. Additional goals were developed during the planning process for the Flood Management Plan in 2013 (Appendix I). Each of the following goal statements represent a broad target for Volusia County and its participating jurisdictions and partners to achieve through the implementation of its more detailed Mitigation Action Plan provided in Section 9: *Mitigation Action Plan*. They are intended to reflect the unique needs and wishes of the communities of Volusia County to have a more “disaster resistant” future.

**TABLE 8.2: Mitigation Goals**

**GOAL 1: LOCAL GOVERNMENT WILL HAVE THE CAPABILITY TO DEVELOP, IMPLEMENT AND MAINTAIN EFFECTIVE MITIGATION PROGRAMS**

**Objective 1:** Data and information needed for defining hazards, risk areas, and vulnerabilities in the community will be obtained.

**Objective 2:** The capability to effectively utilize available data and information related to mitigation planning and program development will be available.

**Objective 3:** The effectiveness of mitigation initiatives implemented in the community will be measured and documented.

**Objective 4:** Up-to-date technical skills in mitigation planning and programming will be available for the community.

**Objective 5:** There will be a program to derive mitigation “lessons learned” from each significant disaster event occurring in or near the community.

**GOAL 2: ALL SECTORS OF THE COMMUNITY WILL WORK TOGETHER TO CREATE A DISASTER RESISTANT COMMUNITY BY THE YEAR 2020**

**Objective 1:** A business continuity and recovery program will be established and implemented in the community.

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**Objective 2:** Local agencies and organizations will establish specific interagency agreements for the development and implementation of mitigation-related projects and programs.

**Objective 3:** Local elected governing bodies will promulgate the local mitigation plan and support community mitigation programming.

**Objective 4:** Outreach programs to gain participation in mitigation programs by business, industry, institutions and community groups will be developed and implemented.

**Objective 5:** The community will be periodically updated regarding local efforts in mitigation planning and programming.

**Objective 6:** The community's public and private sector organizations will partner to promote hazard mitigation programming throughout the community.

### GOAL 3: THE COMMUNITY WILL HAVE THE CAPABILITY TO INITIATE AND SUSTAIN EMERGENCY RESPONSE OPERATIONS DURING AND AFTER A DISASTER

**Objective 1:** Designated evacuation routes will be relocated, retrofitted, or modified to remain open before, during and after disaster.

**Objective 2:** Designated evacuation shelters will be retrofitted or relocated to ensure their operability during and after disaster events.

**Objective 3:** Emergency services organizations will have the capability to detect emergency situations and promptly initiate emergency response operations.

**Objective 4:** Local emergency services facilities will be retrofitted or relocated to withstand the structural impacts of disasters.

**Objective 5:** Response capabilities will be available to protect visitors, special needs individuals, and the homeless from a disaster's health and safety impacts.

**Objective 6:** Shelters or structures for vehicles and equipment needed for emergency services operation will be retrofitted or relocated to withstand disaster impacts.

**Objective 7:** Utility and communications systems supporting emergency services operations will be retrofitted or relocated to withstand the impacts of disasters.

**Objective 8:** Vehicle access routes to key health care facilities will be protected from blockage as a result of a disaster.

### GOAL 4: THE CONTINUITY OF LOCAL GOVERNMENT OPERATIONS WILL NOT BE SIGNIFICANTLY DISRUPTED BY DISASTERS

**Objective 1:** Buildings and facilities used for the routine operations of government will be retrofitted or relocated to withstand the impacts of disasters.

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**Objective 2:** Community redevelopment plans will be prepared to guide decision-making and resource allocation by local government in the aftermath of a disaster.

**Objective 3:** Important local government records and documents will be protected from the impacts of disasters.

**Objective 4:** Plans and programs will be available to assist local government employees in retrofitting or relocating their homes to ensure their availability during a disaster.

**Objective 5:** Plans will be developed, and resources identified, to facilitate reestablishing local government operations after a disaster.

**Objective 6:** Redundant equipment, facilities, and/or supplies will be obtained to facilitate reestablishing local government operations after a disaster.

### GOAL 5: THE THREAT OF DISASTERS TO THE HEALTH, SAFETY AND WELFARE OF THE COMMUNITY'S RESIDENTS AND VISITORS WILL BE MINIMIZED

**Objective 1:** Adequate systems for notifying the public at risk and providing emergency instruction during a disaster will be available in all identified hazard areas.

**Objective 2:** Effective structural measures will be developed to protect residential areas from the physical impacts of disasters.

**Objective 3:** Facilities in the community posing an extra health or safety risk when damaged or disrupted will be made less vulnerable to the impacts of a disaster.

**Objective 4:** Public and private medical and health care facilities in the community will be retrofitted or relocated to withstand the impacts of disasters.

**Objective 5:** Residential structures will be removed or relocated from defined hazard areas.

**Objective 6:** Residential structures will be retrofitted to withstand the physical impacts of disasters.

**Objective 7:** Safety devices on transportation networks will not fail because of a disaster.

**Objective 8:** Structures, facilities and systems serving visitors to the community will be prepared to meet their immediate health and safety needs.

**Objective 9:** There will be adequate resources, equipment and supplies to meet victims' health and safety needs after a disaster.

### GOAL 6: THE POLICIES AND REGULATIONS OF LOCAL GOVERNMENT WILL SUPPORT EFFECTIVE HAZARD MITIGATION PROGRAMMING THROUGHOUT THE COMMUNITY

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**Objective 1:** All reconstruction or rehabilitation of local government facilities will incorporate techniques to minimize the physical or operational vulnerability to disasters.

**Objective 2:** Land use policies, plans and regulations will discourage or prohibit inappropriate location of structures or infrastructure components in areas of higher risk.

**Objective 3:** Local government will ensure that hazard mitigation needs and programs are given appropriate emphasis in resource allocation and decision-making.

**Objective 4:** Local governments will establish and enforce building and land development codes that are effective in addressing the hazards threatening the community.

**Objective 5:** Local governments will protect high hazard natural areas from new or continuing development.

**Objective 6:** Local jurisdictions will participate fully in the National Flood Insurance Program and the associated Community Rating System.

**Objective 7:** New local government facilities will be located outside of hazard areas and/or will be designed to not be vulnerable to the impacts of such hazards.

**Objective 8:** Reconstruction and rehabilitation of structures and utilities in the community will incorporate appropriate hazard mitigation techniques.

**Objective 9:** Regulations will be established and enforced to ensure that public and private property maintenance is consistent with minimizing vulnerabilities to disaster.

### GOAL 7: RESIDENTS OF THE COMMUNITY WILL HAVE HOMES, INSTITUTIONS AND PLACES OF EMPLOYMENT THAT ARE LESS VULNERABLE TO DISASTERS

**Objective 1:** Economic incentive programs for the general public, businesses and industry to implement structural and non-structural mitigation measures will be established.

**Objective 2:** Local government will support key employers in the community in the implementation of mitigation measures for their facilities and systems.

**Objective 3:** Programs for removal, relocation or retrofitting of vulnerable structures and utilities in hazard areas will be established and implemented.

**Objective 4:** The vulnerability to disasters of schools, libraries, museums, and other institutions important to the daily lives of the community will be minimized.

### GOAL 8: THE ECONOMIC VITALITY OF THE COMMUNITY WILL BE ENHANCED BY THE MITIGATION STRATEGY, PRE- AND POST-DISASTER RECOVERY PLANNING

**Objective 1:** Components of the infrastructure needed by the community's businesses and industries will be protected from the impacts of disaster.

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**Objective 2:** Local government emergency response and disaster recovery plans will appropriately consider the needs of key employers in the community.

**Objective 3:** Local government will encourage community businesses and industries to make their facilities and operations disaster resistant.

**Objective 4:** Local government will establish programs, facilities and resources to support business resumption activities by impacted local businesses and industry.

**Objective 5:** Local government will implement programs to address public perceptions of community condition and functioning in the aftermath of a disaster.

**Objective 6:** Local government will strive to diversify the employment base of the community.

### GOAL 9: THE AVAILABILITY AND FUNCTIONING OF THE COMMUNITY'S INFRASTRUCTURE WILL BE MINIMALLY DISRUPTED BY A DISASTER

**Objective 1:** Local governments will encourage hazard mitigation programming by private sector organizations owning or operating key community utilities.

**Objective 2:** Routine maintenance of the community's infrastructure will be done to minimize the potential for system failure because of or during a disaster.

**Objective 3:** Sources of energy normally used by the community will not be unwarrantedly vulnerable to the impacts of a disaster.

**Objective 4:** The telecommunications systems and facilities serving the community will not be unwarrantedly vulnerable to the impacts of a disaster.

**Objective 5:** Transportation facilities and systems serving the community will be constructed and/or retrofitted to minimize the potential for disruption during a disaster.

**Objective 6:** Water and sewer services in the community will not fail because of a disaster.

### GOAL 10: MEMBERS OF THE COMMUNITY WILL UNDERSTAND THE HAZARDS THREATENING LOCAL AREAS AND THE TECHNIQUES TO MINIMIZE VULNERABILITY TO THOSE HAZARDS

**Objective 1:** All interested individuals will be encouraged to participate in hazard mitigation planning and training activities.

**Objective 2:** Education programs in risk communication and hazard mitigation will be established and implemented.

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**Objective 3:** Managers of public facilities will be knowledgeable in hazard mitigation techniques and the components of the community's mitigation plan.

**Objective 4:** Technical training in mitigation planning and programming will be given to appropriate local government employees.

**Objective 5:** The owners and operators of businesses and industries in the community will be knowledgeable in appropriate hazard mitigation techniques.

**Objective 6:** The public living or working in defined hazard areas will be aware of that fact, understand their vulnerability and know appropriate mitigation techniques

**Objective 7:** The public will have facilitated access to information needed to understand their vulnerability to disasters and effective mitigation techniques

### 8.3 IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

#### 44 CFR Requirement

**44 CFR Part 201.6(c)(3)(ii):**

The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effect of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In formulating the local Mitigation Strategy for Volusia County, a wide range of activities were considered in order to help achieve the established mitigation goals in addition to addressing any specific and targeted hazard concerns. These activities were discussed by the LMS Working Group at meetings held over the course of plan development. In general, all activities considered by the LMS Working Group can be classified under one of the following six (6) broad categories of mitigation techniques.

#### 1. Prevention

Preventative measures are intended to keep hazard problems from getting worse, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are built. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- ▶ Planning and zoning
- ▶ Building codes
- ▶ Open space preservation
- ▶ Floodplain regulations
- ▶ Stormwater management regulations
- ▶ Drainage system maintenance

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- ▶ Capital improvements programming
- ▶ Riverine / fault zone setbacks

### 2. Property Protection

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- ▶ Acquisition
- ▶ Relocation
- ▶ Building elevation
- ▶ Critical facilities protection
- ▶ Retrofitting (e.g., windproofing, floodproofing, seismic design techniques, etc.)
- ▶ Safe rooms, shutters, shatter-resistant glass
- ▶ Insurance

### 3. Natural Resource Protection

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes and sand dunes. Parks, recreation or conservation agencies and organizations often implement these protective measures. Examples include:

- ▶ Floodplain protection
- ▶ Watershed management
- ▶ Riparian buffers
- ▶ Forest and vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- ▶ Erosion and sediment control
- ▶ Wetland preservation and restoration
- ▶ Habitat preservation
- ▶ Slope stabilization

### 4. Structural Projects

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- ▶ Reservoirs
- ▶ Dams / levees / dikes / floodwalls
- ▶ Diversions / detention / retention
- ▶ Channel modification
- ▶ Storm sewers

### 5. Emergency Services

Although not typically considered a “mitigation” technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

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- ▶ Warning systems
- ▶ Evacuation planning and management
- ▶ Emergency response training and exercises
- ▶ Sandbagging for flood protection
- ▶ Installing temporary shutters for wind protection

### 6. Public Education and Awareness

Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- ▶ Outreach projects
- ▶ Speaker series / demonstration events
- ▶ Hazard map information
- ▶ Real estate disclosure
- ▶ Library materials
- ▶ School children educational programs
- ▶ Hazard expositions

## 8.4 SELECTION OF MITIGATION TECHNIQUES FOR VOLUSIA COUNTY

In order to determine the most appropriate mitigation techniques for Volusia County, the LMS Working Group thoroughly reviewed and considered the findings of the *Capability Assessment* and *Risk Assessment*. Other considerations included each individual mitigation action's effect on overall risk to life and property, health and safety, the environment, plan consistency, its ease of implementation and general cost-effectiveness, and funding availability (if necessary).

FEMA guidance for meeting the planning requirements of the Disaster Mitigation Act of 2000 specifies that local governments should prioritize their mitigation actions based on the level of risk a hazard poses to life and property. In response to this requirement, the LMS Working Group used and completed a Mitigation Techniques Matrix (**Table 8.3**) to make certain they addressed, at a minimum, those hazards posing the greatest threat.

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**TABLE 8.3: Mitigation Techniques Matrix for Volusia County**

MITIGATION TECHNIQUE	HIGH RISK HAZARDS			
	FLOOD	HURRICANE AND TROPICAL STORM	STORM SURGE	TORNADO
Prevention	✓	✓	✓	✓
Property Protection	✓	✓	✓	✓
Natural Resource Protection	✓	✓	✓	
Structural Projects	✓	✓	✓	✓
Emergency Services	✓	✓	✓	✓
Public Education & Awareness	✓	✓	✓	✓

The Mitigation Techniques Matrix provides the LMS Working Group with the opportunity to cross-reference each of the priority high risk hazards (as determined by through the *Risk Assessment*) with the aforementioned comprehensive range available mitigation techniques, including prevention; property protection; natural resource protection; structural projects; emergency services; and public education and awareness. However, it is important to note that Volusia County’s Mitigation Action Plan includes an array of actions targeting multiple hazards, and is not necessarily limited to only those classified as high risk.

### 8.5 MITIGATION SUCCESS STORIES

Completed mitigation projects in any community represent a proactive approach to reducing vulnerability. It can often be difficult to convince a community to use funds for an imminent disaster when no danger is present and local, state, and federal funding sources pose a competitive application process. However, the payoff for these proactive actions can be immense. Mitigation helps to avert loss of life and injury, reduce damage to public and private property, lessen expenditure of resources and exposure to risk for first responders, reduce costs of disaster response and recovery, accelerate recovery of communities and businesses affected by disasters, and enhance community resiliency<sup>1</sup>. Many of the

<sup>1</sup> “Recommendations for an Effective National Mitigation Effort.” National Emergency Management Association (NEMA), 2009.

## SECTION 8: MITIGATION STRATEGY

jurisdictions in Volusia County have completed mitigation projects that reduced vulnerability. Some of these examples are profiled below.

### **Daytona Beach**

The City of Daytona Beach City Hall is a critical facility that houses many of the City's emergency response personnel. It is a central point of information for its residents and a place where many critical decisions are made. The City received HMGP funds after the 2004 hurricanes and those grant funds were used to install hurricane resistant impact glass through the entire facility. This critical facility won't need to be evacuated for minor hurricanes and the contents now have protection against wind events.

The City used HMGP funds from the 2004 hurricanes to retrofit all the doors and windows at the Public Works complex which is also a critical facility. This facility was hardened and upgraded with impact glass and hurricane rated doors. This facility is the main location for the Public Works response personnel handling road repairs, signs, vehicle maintenance, debris removal, garbage pick up, etc.

### **Edgewater**

The City of Edgewater has demonstrated a proactive operation by embarking on mitigation projects using city and grant funds to prevent further damage or loss of public and private properties.

- ▶ The City purchased a repetitive loss home on West Pine Bluff, demolished it and constructed a retention pond to eliminate flooding in the neighborhood.
- ▶ City owned facilities were improved to be more storm resistant using city and grant funds.
- ▶ Stormwater pipe was lined in the Wildwood Subdivision to prevent the continual flooding using city funds.
- ▶ The Environmental Services Department Stormwater Division provides continual maintenance to all canals, swales, and retention points to eliminate problems with the stormwater system throughout the city.
- ▶ Seagrass was planted along the riverbank at Kennedy Park to eliminate erosion of shoreline.

### **South Daytona**

After Tropical Storm Gordon, the City of South Daytona set an aggressive course to eliminate the flooding of homes. To achieve this, South Daytona increased stormwater utility fees to fund many of the needed improvements to protect residents and their homes and made major changes to the building standards. While the system is not perfect, the number of homes with storm water damage in the most recent storm dropped from 300 homes during Gordon to 16. This reflects an 80 percent reduction in homes flooded.

## **8.6 PLAN UPDATE REQUIREMENT**

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Because of FEMA requirements for plan updates the existing Mitigation Actions (as identified in the 2009 plan) were reviewed by each agency responsible identified for implementing the action. For each action, an update on the implementation status (completed, deleted, or deferred) was provided and milestones achieved or impediments to implementation of the actions were identified. These updates have been provided in Section 9: *Mitigation Action Plan*. In addition to revisiting the previously adopted mitigation actions, many new actions were identified by the LMS Working Group for the 2009 plan and updated during the 2014 planning process.

## SECTION 9 – MITIGATION ACTION PLAN

### 44 CFR Requirement

**44 CFR Part 201.6(c)(3)(iii):** The mitigation strategy shall include an action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction.

This section includes the listing of the mitigation actions proposed by Volusia County and its participating jurisdictions and partners. It has been designed to achieve the mitigation goals and objectives established in Section 8: Mitigation Strategy, and will be maintained on a regular basis according to the plan maintenance procedures established in Section 10: Plan Maintenance Procedures.

As described in the previous section, the Mitigation Action Plan, or MAP, represents an unambiguous and functional plan for action. Each proposed mitigation action has been identified as an effective measure (policy or project) to reduce hazard vulnerability for Volusia County.

Most importantly, implementation mechanisms are provided for each action, including the designation of a lead agency or department responsible for implementing the action. Specific information regarding project cost and timeframe for its completion are on file with Volusia County Emergency Management. These implementation mechanisms ensure that Volusia County Local Mitigation Strategy remains a functional document that can be monitored for progress over time.

**Table 9.1** describes the key elements of the Mitigation Action Plan.

## SECTION 9: MITIGATION ACTION PLAN

**Table 9.1: Key Elements of the Mitigation Action Plan**

<b>Priority</b>	Indicates whether the action is a “low” priority, “moderate” priority or “high” priority based on the established prioritization criteria: Low = <10; Moderate = 11-24; High = 25+
<b>Jurisdiction</b>	Identifies the geographic location where the initiative is located.
<b>Responsible Organization</b>	Identifies the local agency, department or organization that is best suited to implement the proposed action, project or initiative.
<b>Hazard(s)</b>	Lists the hazard(s) the proposed action is designed to mitigate against.
<b>Mitigation Technique Category</b>	Indicates the mitigation technique that the proposed action is designed to help achieve. Categories include: E = Emergency Services; P = Prevention; PE = Public Education; PP = Property Protection; S = Structural
<b>Initiative</b>	Identifies a specific action that, if accomplished, will reduce vulnerability and risk in the impact area. Actions may be in the form of local policies (i.e., regulatory or incentive-based measures), programs or structural mitigation projects and should be consistent with any pre-identified mitigation goals and objectives. An identification number is provided. The county has additional information on file for each initiative (e.g., location, damage history, specific mitigation measure, estimated cost, etc.)
<b>Funding</b>	If applicable, indicates how the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets or general funds, a previously established contingency fund, a cost-sharing federal or state grant program, etc. The default funding source for initiatives within this listing is the Hazard Mitigation Grant Program (HMGP). Outside of the HMGP, funding sources for these projects are typically determined on the local level for “proactive” projects that do not need a disaster declaration to be funded. However, most of the projects on this listing do not have a set funding source, which defaults the project to HMGP. If identified, specific funding sources will be attributed to initiatives.
<b>Approved by LMS Working Group</b>	Identifies the date when the initiative was approved by the LMS Working Group
<b>Completion Date</b>	Indicates when the action was completed. Remember that some actions will require only a minimal amount of time, while others may require a long-term or continuous effort. Projects are “deferred” or “terminated” from list listing at the discretion of the jurisdiction that is implementing those changes. When initiatives are deferred or deleted on the jurisdictional level, countywide representatives are notified via the LMS Working Group (or Volusia Prepares) and the countywide initiative listing is updated at that time.
<b>Status</b>	<p>The status indicators for each initiative is as follows:</p> <ul style="list-style-type: none"> <li>• C = Completed</li> <li>• D = Deferred <i>***See notes under “Completion Date” above***</i></li> <li>• N = New</li> <li>• T = Terminated <i>***See notes under “Completion Date” above***</i></li> <li>• U = Updated</li> <li>• A = Active/Open</li> </ul>

## SECTION 9: MITIGATION ACTION PLAN

Each mitigation initiative has been scored by the responsible jurisdiction. The scoring system is included in Section 8: Mitigation Strategy (Table 8.1).

Prioritizing the proposed mitigation actions was based on the following 11 factors:

- ▶ Population Benefited
- ▶ Health and Safety Considerations
- ▶ Environmental Impact
- ▶ Consistency with Other Plans and Programs
- ▶ Reduces Risk of Future Property Damage
- ▶ Supports Essential or Critical Services
- ▶ Probability of Receiving Funding for Implementation
- ▶ Feasibility of Implementation
- ▶ Community Rating System
- ▶ Repetitive Loss Mitigation
- ▶ Benefit Cost Ratio (to be conducted prior to submitting a project for grant consideration)

Each mitigation initiative was scored on 10 of these 11 factors. The jurisdictions have not run an official benefit cost analysis (BCA) for the initiatives at this time. The jurisdictions did include a general BCA in the mitigation initiative application that was submitted to Volusia County Emergency Management. However, the BCA will be run for the initiatives following a disaster to factor in all known damage costs.

The mitigation initiatives are not listed in exact priority order, though each has been assigned a priority level of “low”, “moderate”, or “high”. Once the BCA is run, a numerical priority will be assigned.

All mitigation initiatives included in the Action Plan that propose to reduce flood hazard vulnerability advance the intent of the National Flood Insurance Program (NFIP), as they will meet the current local floodplain regulations adopted by the jurisdictions as required by the NFIP. Two of the scoring factors used to determine the priority of the actions specifically address the intent of the NFIP and the Community Rating System (CRS). These two factors consider whether the initiative supports elements of the CRS and reduces repetitive flood losses.

Volusia County is highly committed to reducing flood losses in support of the NFIP, and has predominantly used local funding to implement these projects. From 1999 to 2014, 163 flood hazard vulnerability reduction initiatives have been completed and 175 are open. Examples of these initiatives include: acquiring and relocating repetitive loss structures, relocating critical facilities from the 100-year floodplain, floodproofing equipment at water treatment plants, performing drainage improvement projects and creating new topographic maps based on newly collected Light Detection and Ranging (LiDAR) data. Also, of the 175 open mitigation initiatives, approximately half support flood hazard vulnerability reduction.

The open mitigation initiatives are listed in the Action Plan in **Table 9.2**. If a mitigation initiative does not have a status indicator, it is considered “open”. The county is in the process of transitioning to this new scoring system and information is still being collected by several of the jurisdictions. Mitigation initiatives that are highlighted in yellow are pending the scoring process by the jurisdiction. All mitigation actions and status are provided in Appendix F as part of the Individual Jurisdictional Mitigation Plans.

## SECTION 9: MITIGATION ACTION PLAN

**Table 9.2: Mitigation Action Plan: Open Mitigation Initiatives by Jurisdiction**

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
	Daytona Beach	City of Daytona Beach	Flood	S	VOL-0422 Acquisition/Demolition of Repetitive Loss Structure	HMGP	Pre-2014	WITH FUNDING	N
	Daytona Beach	City of Daytona Beach	Flood	S	VOL-0423 Acquisition/Demolition of Repetitive Loss Structure	HMGP	Pre-2014	WITH FUNDING	N
	Daytona Beach	City of Daytona Beach	Flood	S	VOL-0425 Acquisition/Demolition of Repetitive Loss Structure	HMGP	Pre-2014	WITH FUNDING	N
	Daytona Beach	City of Daytona Beach	Flood	S	VOL-0432 Acquisition/Demolition of Repetitive Loss Structure	HMGP	Pre-2014	WITH FUNDING	N
	Daytona Beach	City of Daytona Beach	Flood	S	VOL-0446 Acquisition and demolition of repetitive loss structure. The residential structure at South Keech Street.	HMGP	Pre-2014	WITH FUNDING	N
H	Daytona Beach	City of Daytona Beach Fire	Flood	PP	Rep Loss; Acquisition and Demolition.	HMGP	Pre-2014	WITH FUNDING	N
H	Daytona Beach	City of Daytona Beach Fire	Flood	PP	RepLoss; Acquisition and Demolition	HMGP	Pre-2014	WITH FUNDING	N
	Daytona Beach	Utilities	Flood	PP	RepLoss; Acquisition and Demolition	HMGP	2009	WITH FUNDING	N
	Daytona Beach	Utilities	Flood	PP	RepLoss; Acquisition and Demolition	HMGP	2009	WITH FUNDING	N
	Daytona Beach	Utilities	Flood	PP	RepLoss; Acquisition and Demolition	HMGP	2009	WITH FUNDING	N
H	Daytona Beach	Utilities	Flood	PP	RepLoss Acquisition and Demolition	HMGP	2009	WITH FUNDING	N
	Daytona Beach	Utilities	Flood	PP	RepLoss Acquisition and Demolition	HMGP	2009	WITH FUNDING	N

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
	Daytona Beach	Public Works	Flood	P	VOL-0443 The city will be completing storm water mitigation along Orange Ave to reduce flooding in nearby Critical Facilities, repetitive loss properties.	HMGP	12/9/2009	WITH FUNDING	N
H	Daytona Beach	Utilities	Flood	PP	VOL-0165 Stormwater/flood abatement	HMGP	10/1/2001	WITH FUNDING	N
M	Daytona Beach	Utilities	Flood	PP	VOL-0166 A-5 barrier peninsula watershed Ocean Dunes Rd/Ocean Dunes Tr/Wisteria Rd.	HMGP	10/1/2001	WITH FUNDING	D
M	Daytona Beach	Utilities	Flood	S	VOL-0168 B-3 Halifax River drainage basin-Wilder Outfall Study	HMGP	8/1/2001	WITH FUNDING	N
	Daytona Beach	Utilities	Flood	S	VOL-0044 R B5/B6 Phase 2 – Nova Canal Drainage basin	HMGP	8/1/1999	WITH FUNDING	D
H	Daytona Beach Shores	City of Daytona Beach Shores	Wind	PP	VOL-0411 Replace the roof at Daytona Beach Shores City Hall	HMGP	1/7/2009	WITH FUNDING	N
	DeBary	City of DeBary	Flood	S	VOL-0414 Implementation of a storm sewer system to prevent yard, roadway and structural flooding along Naranja Road and 2 <sup>nd</sup> Street West.	HMGP	Pre-2014	WITH FUNDING	N
	DeBary	City of DeBary	Flood	S	May Place Acquisition and Demolition Project	HMGP	Pre-2014	WITH FUNDING	N
H	DeBary	City of DeBary	Flood	S	VOL-0288 City of DeBary Emergency Outfall System	HMGP	12/7/2004	WITH FUNDING	A
M	DeBary	City of DeBary	Wind	PP	VOL-0341 Provide hurricane shutters for doors & windows at Sheriff's Office	HMGP	1/12/2005	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
	DeBary	City of DeBary	Multi	PP	VOL-0346 Purchase 15 800mhz radios	HMGP	1/12/2005	WITH FUNDING	D
L	DeBary	City of DeBary	Multi	ES	VOL-0347 Programmable message boards/trailers	HMGP	1/12/2005	WITH FUNDING	A
M	DeBary	City of DeBary	Multi	PE	VOL-0390 Community Information using an AM radio frequency EAS	HMGP	3/7/2006	WITH FUNDING	A
H	DeBary	City of DeBary	Flood	S	VOL-0403 Gravity Overflow Systems	HMGP	11/18/2008	WITH FUNDING	A
H	DeBary	City of DeBary	Flood	S	VOL-0404 East Side Flood Management System Upgrade	HMGP	11/18/2008	WITH FUNDING	A
	DeBary	Pegasus Engineering	Flood	P	VOL-0445 Implementation of a storm sewer system to prevent yard, roadway and structural flooding.	HMGP	3/10/2010	WITH FUNDING	N
H	DeLand	City of DeLand	Flood	PP	VOL-0349 Acquisition and expansion of stormwater for DeLand Middle School	HMGP	2/14/2005	WITH FUNDING	D
H	DeLand	City of DeLand	Wind	PP	VOL-0350 Hardening DeLand City Hall	HMGP	2/14/2005	WITH FUNDING	D
H	DeLand	City of DeLand	Flood	PP	VOL-0351 Acquire flooded property along New Hampshire between Amelia Ave & Garfield	HMGP	2/14/2005	WITH FUNDING	U
H	DeLand	City of DeLand Public Services	Flood	ES	VOL-0053 Purchase/install emergency generator for Volusia County Fairgrounds	HMGP	8/1/1999	WITH FUNDING	U

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
H	DeLand	City of DeLand Public Services	Flood	ES	VOL-0054 Purchase/install emergency generator for Pistol Range Road	HMGP	8/1/1999	WITH FUNDING	U
H	DeLand	City of DeLand Public Services	Flood	S	VOL-0241 Acquisition and expansion of stormwater ponds	HMGP	10/13/2004	WITH FUNDING	U
H	DeLand	City of DeLand Public Services	Flood	S	VOL-0242 Raise head works and effluent pump station	HMGP	10/13/2004	WITH FUNDING	U
H	DeLand	City of DeLand Public Works	Flood	S	VOL-0002 Construct a stormwater pumping station and force main	HMGP	8/1/1999	WITH FUNDING	U
M	Deltona	City of Deltona Fire Rescue	Flood	PE	VOL- 0376 Public Education Specialist	HMGP	8/1/1999	WITH FUNDING	A
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0085 Outfall improvements for Pioneer Lake	HMGP	8/1/1999	WITH FUNDING	A
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0086- Outfall improvements for Castle Lake	HMGP	8/1/1999	WITH FUNDING	A
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0090 Culvert improvements at Enterprise-Osteen Road	HMGP	8/1/1999	WITH FUNDING	A
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0406 Lake Lapanocia Pump Station	HMGP	1/7/2009	WITH FUNDING	N
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0407 Piedmont Pump Station	HMGP	1/7/2009	WITH FUNDING	N

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0408 Kingsway/Lehigh Culvert	HMGP	1/7/2009	WITH FUNDING	N
M	Deltona	City of Deltona Public Works	Flood	S	VOL-0409 Tivoli & Wheeling Pump	HMGP	9/21/2005	WITH FUNDING	A
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0458 Blackburn Avenue and Eldridge Street Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0459 Brickell Drive Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0460 Exmore Avenue Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0461 Lamplighter-Section Line Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0462 Leland Drive Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0463 Montebello Avenue Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0464 Picasso Avenue Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0465 Tune Avenue Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
	Deltona	City of Deltona Public Works	Flood	PP	VOL-0466 Zinnia Avenue Stormwater Improvements	HMGP	6/11/2014	WITH FUNDING	N
M	Edgewater	City of Edgewater	Flood	PP	VOL-0421 Acquire repetitive flood loss home at Sabal Palm Drive	HMGP	6/17/2009	WITH FUNDING	N
H	Edgewater	City of Edgewater	Multi	ES	VOL-0424 Purchase two (2) portable 6" pumps	HMGP	6/17/2009	WITH FUNDING	N

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
H	Edgewater	City of Edgewater	Flood	S	VOL-0426 Retrofit lift station #5 & #1	HMGP	6/17/2009	WITH FUNDING	N
H	Edgewater	City of Edgewater	Multi	ES	VOL-0428 Permanent emergency backup generator and gas line for IT Bldg (115 E Park Ave)	HMGP	6/17/2009	WITH FUNDING	N
M	Edgewater	City of Edgewater Fire Department	Multi	ES	VOL-0070 Purchase emergency back-up generator for the YMCA	HMGP	8/1/1999	WITH FUNDING	U
H	Edgewater	City of Edgewater Fire Department	Wind	PP	VOL-0316 Install window & Storm protection to Utilities office	HMGP	12/8/2004	WITH FUNDING	U
M	Edgewater	City of Edgewater Fire Department	Flood	PP	VOL-0334R Acquire repetitive loss home at Cheeta Drive	HMGP	1/12/2005	WITH FUNDING	U
L	Holly Hill	City of Holly Hill	Flood	S	VOL-0278 Trailer mounted emergency pumps	HMGP	Pre-2014	WITH FUNDING	A
L	Holly Hill	City of Holly Hill	Flood	PP	VOL-0357 Cave Avenue Structure purchase	HMGP	2/14/2005	WITH FUNDING	A
--	Holly Hill	City of Holly Hill	Multi	PP	VOL-0457 Hurricane shutters and city hall annex	HMGP	Pre-2014	WITH FUNDING	N
L	Holly Hill	City of Holly Hill Public Works	Flood	S	VOL-0279 State Avenue (6th - 8th St) Department Stormwater	HMGP	1/12/2005	WITH FUNDING	A
L	Holly Hill	City of Holly Hill Public Works	Flood	S	VOL-0280 Tuscaloosa Street drainage Department improvements	HMGP	1/12/2005	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
L	Holly Hill	City of Holly Hill Public Works	Flood	S	VOL-0281 Eagle Drive and Peacock Rd Department Drainage Improvements	HMGP	1/12/2005	WITH FUNDING	A
L	Holly Hill	City of Holly Hill Public Works	Flood	S	VOL-0282 Espanola Ave Drainage Department Improvements	HMGP	1/12/2005	WITH FUNDING	A
L	Holly Hill	Holly Hill Public Safety	Multi	ES	VOL-0183 Purchase a passenger van/trailer and traffic control equipment	HMGP	11/17/2002	WITH FUNDING	A
H	Lake Helen	City of Lake Helen	Wind	PP	VOL-0051 Renovate to harden the Police building	HMGP	8/1/1999	WITH FUNDING	A
H	Lake Helen	City of Lake Helen	Wind	PP	VOL-0216 Storm Shutters for Police Department and EOC	HMGP	10/13/2004	WITH FUNDING	A
L	New Smyrna Beach	City of New Smyrna Beach Fire	Multi	ES	VOL-0103R Relocate and replace Fire Department Station #50 (main station)	HMGP	8/1/1999	WITH FUNDING	U
L	New Smyrna Beach	City of New Smyrna Beach	Wind	ES	Vol-0385- Fire Station 50 Impact Resistant Glass	FEMA	9/10/2007	WITH FUNDING	U
M	New Smyrna Beach	City of New Smyrna Beach	Flood	PP	Vol-0386-Central Beachside Flood Mitigation Project Phase II	FEMA	9/10/2007	WITH FUNDING	U
L	New Smyrna Beach	City of New Smyrna Beach	Wind	PP	Vol-0394-Installing Impact Resistant Windows in the New Smyrna City Gym	FEMA	9/10/2007	WITH FUNDING	U
M	New Smyrna Beach	City of New Smyrna Beach	Flood	S	VOL-0410 New Smyrna Beach Central Beachside Storm Water Management Project	HMGP	1/7/2009	WITH FUNDING	U

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L	New Smyrna Beach	City of New Smyrna Beach	Wind	PP	Vol-384- Wind Resistance Protective Measures	FEMA	9/10/2007	2010	U
H	Oak Hill	City Hall	Wind	PP	VOL--0217 Harden City Hall/Police	HMGP	10/13/2004	WITH FUNDING	A
H	Orange City	City of Orange City	Flood	S	VOL-0398 - Fawn Ridge Subdivision	HMGP	10/7/2008	WITH FUNDING	A
H	Orange City	City of Orange City	Flood	S	VOL-0399 Treemont Drainage Project	HMGP	10/7/2008	WITH FUNDING	A
	Orange City	City of Orange City	Flood	PP	VOL-0451 Mill Lake & Pooser Pond Stormwater improvement. Install stormwater pump stations to prevent flooding.	HMGP	9/14/2011	WITH FUNDING	A
M	Ormond Beach	City of Ormond Beach	Wind	PP	VOL-0151 Purchase hurricane shutters and generator power for the Performing Arts Center	HMGP	12/1/2000	WITH FUNDING	A
H	Ormond Beach	City of Ormond Beach	Multi	ES	VOL-0194 Purchase 30 emergency radios for use during emergencies	HMGP	11/18/2002	WITH FUNDING	A
H	Ormond Beach	City of Ormond Beach	Flood	PP	VOL-0400 Elevate Whitley residence, Cumberland Avenue	HMGP	10/7/2008	WITH FUNDING	N
	Ormond Beach	City of Ormond Beach	Flood	PP	VOL-0435 This initiative is to acquire at risk structures in the Central Park area along Laurel Creek Thompson Creek and FP&L Ditch, including 2 repetitive Loss structures.	HMGP	9/9/2009	WITH FUNDING	A
M	Ormond Beach	City of Ormond Beach	Flood	S	Vol-0387- Thompson Creek Stormwater Department Improvement	HMGP	9/10/2007	WITH FUNDING	A

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M	Ormond Beach	City of Ormond Beach Public Works	Flood	S	VOL-0050 Drainage improvements to areas of "Old Ormond" (mainland)	HMGP	8/1/1999	WITH FUNDING	A
	Ormond Beach	Emergency Management	Flood	PP	VOL-0442 Central Park Drainage Improvements – will provide flood mitigation benefits by acquisition of land and construction of control	HMGP	12/9/2009	WITH FUNDING	N
	Pierson	Town of Pierson	Wind	PP	VOL-0028 Harden the Town Hall by installing motorized roll down shutters	HMGP	9/1/1999	WITH FUNDING	A
	Pierson	Town of Pierson	Multi	P	VOL-0218 Secure water supply	HMGP	10/13/2004	WITH FUNDING	A
	Pierson	Town of Pierson	Multi	ES	VOL-0219 Establish an Emergency Operations Center in Community Center	HMGP	10/13/2004	WITH FUNDING	A
	Pierson	Town of Pierson	Wind	PP	VOL-0220 Establish an MH retrofit tie-down program	HMGP	10/13/2004	WITH FUNDING	A
	Pierson	Town of Pierson	Flood	S	VOL-0221 Establish stormwater management maintenance program	HMGP	10/13/2004	WITH FUNDING	A
	Pierson	Town of Pierson	Multi	ES	VOL-0450 Purchase and install emergency generator at Pierson Town Hall	HMGP	3/9/2011	WITH FUNDING	N
H	Ponce Inlet	Ponce Inlet Fire Department	Multi	ES	VOL-0173 Purchase the equipment necessary to equip a mobile command center	HMGP	1/1/2002	WITH FUNDING	A
H	Ponce Inlet	Town of Ponce Inlet	Wind	PP	VOL-0419 Install Hurricane Windows & Entrance Doors on Fire Station	HMGP	6/16/2009	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
H	Ponce Inlet	Town of Ponce Inlet	Flood	S	VOL-0420 Purchase 4" Pump for flood control	HMGP	6/16/2009	WITH FUNDING	A
M	Port Orange	City of Port Orange	Flood	PP	VOL-0130 Purchase Seabird Island; remove mobile homes, and convert the area into a park	HMGP	12/1/2000	WITH FUNDING	N
M	Port Orange	City of Port Orange	Multi	ES	VOL-0169R Retrofit the Port Orange Cypress Head golf course banquet area	HMGP	10/1/2001	WITH FUNDING	N
H	Port Orange	City of Port Orange	Wind	S	VOL-0176 Install FDOT traffic signal arms that can withstand 140MPH wind load	HMGP	1/1/2002	WITH FUNDING	N
H	Port Orange	City of Port Orange	Flood	S	VOL-0228 Taylor Woods and S. Williamson Drainage retrofit	HMGP	10/13/2004	WITH FUNDING	N
H	Port Orange	City of Port Orange	Flood	S	VOL-0229 Taylor RD Drainage retrofit	HMGP	10/13/2004	WITH FUNDING	N
H	Port Orange	Port Orange Emergency Management	Flood	S	VOL-0391 B-23 Canal Seawall Improvement	HMGP	9/10/2007	WITH FUNDING	N
	Port Orange	Volusia County Emergency Management	Flood	P	VOL-0438 Halifax/Nova road drainage – to utilize existing City of Port Orange property	HMGP	11/3/2009	WITH FUNDING	A
	Port Orange	Volusia County Emergency Management	Flood	P	VOL-0439 The intent of the project is to acquire the Summit Golf property	HMGP	11/3/2009	WITH FUNDING	A
	Port Orange	Volusia County Emergency Management	Flood	P	VOL-0440 Intent to mitigate flooding of Dunlawton Ave and SR 421, a major evacuation route to I-95	HMGP	11/3/2009	WITH FUNDING	A

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	Port Orange	Volusia County Emergency Management	Flood	PP	VOL-0441 Acquire properties identified at the end of Spruce Creek Road to install retrofit drainage improvements to mitigate flooding	HMGP	11/3/2009	WITH FUNDING	A
H	Port Orange	Volusia County Emergency Management	Flood	PP	VOL-0437-R Dunlawton Avenue drainage – took out acquisition to acquire 9 parcels south of Dunlawton	HMGP	11/3/2009	WITH FUNDING	U
	Private Non-Profits	Evangelical Lutheran Good	Wind	PP	VOL-0362 Providing hurricane shutters for Samaritan Society nursing homes in Daytona Beach & DeLand	HMGP	4/8/2005	WITH FUNDING	A
H	South Daytona	City of South Daytona	Multi	PP	VOL-0389-South Daytona EOC/Public Works Facility	HMGP	1/10/2007	WITH FUNDING	A
	South Daytona	City of South Daytona	Flood	PP	VOL-0430 Elevate the U shaped section of Green Street from Ridge Blvd from 4.5 feet to 6 feet	HMGP	9/9/2009	WITH FUNDING	N
	South Daytona	City of South Daytona	Multi	UNK	VOL-0447 Acquisition/demolition of repetitive loss structure. The residential structure on South Carolina Street has flooded twice.	HMGP	9/8/2010	WITH FUNDING	N
	South Daytona	City of South Daytona	Wind	PP	VOL-0448 Protect South Daytona Fire Department from damages during high wind events	HMGP	9/8/2010	WITH FUNDING	N
	South Daytona	City of South Daytona	Flood	PP	VOL-0449 To purchase a vacant parcel of land and install a stormwater retention pond to help prevent flooding in 161 homes and on 6 streets that sit at approximately 4.5 foot elevation, which is lower than Reed Canal crests during a major storm event.	HMGP	9/8/2010	WITH FUNDING	N
	Volusia County (Unincorporated)	Environmental Management	Flood	NRP	VOL-0265 Habitat Stabilization/Revegetation Project	HMGP	10/13/2004	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
	Volusia County (Unincorporated)	Environmental Management	Surge	PP	VOL-0266 Shoreline Erosion Control and Restoration Project	HMGP	10/13/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Florida Hospital Fish Memorial	Flood	S	VOL-0405 Florida Hospital Fish Memorial Orange City Retention Pond Project	HMGP	1/7/2009	WITH FUNDING	N
M	Volusia County (Unincorporated)	Public Works	Multi	PP	VOL-0255 Volusia County Public Works Eastside Service Center	HMGP	10/13/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Public Works	Multi	ES	VOL-0256 Mosquito Control Helicopter Hangar	HMGP	10/13/2004	WITH FUNDING	U
H	Volusia County (Unincorporated)	Public Works	Wind	S	VOL-0257 Mast Arm Replacement for Traffic Signals	HMGP	10/13/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Public Works	Multi	S	VOL-0300 Onsite generator for New Hope Villas of Seville wastewater treatment	HMGP	Pre-2014	WITH FUNDING	U
	Volusia County (Unincorporated)	Public Works	Multi	PE	VOL-0323 Overhead School Zone Signs	HMGP	Pre-2014	WITH FUNDING	A
M	Volusia County (Unincorporated)	United Cerebral Palsy of East Central Florida	Wind	PP	VOL-0401 Harden facility to withstand hurricane force winds & meet ARC 4496 shelter standards	HMGP	11/18/2008	WITH FUNDING	U
M	Volusia County (Unincorporated)	VOL2020 MP Subcommittee	Multi	PP/PE/P/S	VOL-0027 LMS Steering Committee support a home mitigation education & incentive program	HMGP	6/1/1999	WITH FUNDING	U

## SECTION 9: MITIGATION ACTION PLAN

**Table 9.2: Mitigation Action Plan: Open Mitigation Initiatives by Jurisdiction**

Status: *C = Complete; D = Deferred; N = New; U = Updated; T = Terminated A = Active (Identified - In Planning Phase)*

Category: *P = Prevention; PP = Property Protection; S = Structural; ES = Emergency Services; PE = Education*

Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
M	Volusia County (Unincorporated)	Volusia County Emergency	Flood	PP	VOL-0259 Shockney DR Mitigation	HMGP	10/13/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0320 DEMO/REBUILD REPETITIVE LOSS HOME AT 1633 SPRING GARDEN DRIVE ASTOR	HMGP	12/7/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0321R Elevate & retrofit rep loss property at Stone Trail, Enterprise	HMGP	2/14/2005	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0336 Demo/rebuild repetitive loss property at Shockney Drive	HMGP	1/12/2005	WITH FUNDING	U
	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0436 Elevate and Retrofit Repetitive Loss Property at Stone Trail	HMGP	11/3/2009	WITH FUNDING	N
	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	S	VOL-0416 Nova Canal Outfall Improvements	HMGP	6/17/2009	WITH FUNDING	N
	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	S	VOL-0417 Miller Lake Flood Improvements	HMGP	6/17/2009	WITH FUNDING	N
	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0427 Unincorporated V.C. Flood Insurance Rate Map Revision	HMGP	6/17/2009	WITH FUNDING	N
	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0429 21 homes on Rio Way flooded as a result of the May 2009 storm. Many are RepLoss	HMGP	9/9/2009	WITH FUNDING	N

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0431 Acquire and demolish 2 structures located at Pioneer Trail, NSB	HMGP	9/9/2009	WITH FUNDING	N
	Volusia County (Unincorporated)	Volusia County Emergency Management	Wind	PP	VOL-0433 Installation of 7-point wind hazard mitigation retrofits for 1000 single family units	HMGP	9/9/2009	WITH FUNDING	N
	Volusia County (Unincorporated)	Volusia County Emergency Management	Wind	PP	VOL-0434 Installation of tie-downs and roof-overs for Wind Hazard Mitigation retrofits for 300 manufactured Homes in Volusia County	HMGP	9/9/2009	WITH FUNDING	N
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Multi	PE	VOL-0366 Understanding Volusia County's demographics to anticipate behavior & mitigate hazards	HMGP	9/12/2005	WITH FUNDING	D
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Multi	PE	VOL-0367 Volusia Prepares Business	HMGP	9/20/2005	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Multi	PE	VOL-0368 Condominium mitigation video	HMGP	9/20/2005	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0380 Shockney DR Mitigation	HMGP	10/13/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0382 Demo/Rebuild Shockney Drive due to repetitive flood losses	HMGP	4/14/2005	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Multi	P	VOL-0023 Develop and implement a Community Emergency Management Academy	HMGP	8/1/1999	WITH FUNDING	D
H	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	S	VOL-0180 Conduct a causeway/bridge vulnerability assessment	HMGP	8/1/2002	WITH FUNDING	D

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0201 Increase the base flood elevation requirement	HMGP	11/1/2002	WITH FUNDING	D
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Wind	PP	VOL-0202 Prohibit the placement of new/replacement manufactured homes in the wind-born debris	HMGP	11/1/2002	WITH FUNDING	D
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Multi	ES	VOL-0204 Integrate and expand the existing CERT programs	HMGP	11/1/2002	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0267 Stone Island Flood Mitigation Project	HMGP	10/13/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0268 Tomoka Estates Flood Mitigation Project	HMGP	10/13/2004	WITH FUNDING	U
M	Volusia County (Unincorporated)	Volusia County Emergency Management	Flood	PP	VOL-0269 Repetitive Loss Property Mitigation	HMGP	10/13/2004	WITH FUNDING	U
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0115 Replace existing Fire Station 23	HMGP	8/1/1999	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0153 Construct a structural collapse training facility	HMGP	12/1/2000	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0154 Purchase specialized rescue equipment	HMGP	12/1/2000	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0270 Emergency Power for 4 County Fire Stations	HMGP	10/13/2004	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0271 Training Facility Improvements	HMGP	10/13/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0274 Weather Stations for 22 Fire Stations	HMGP	10/13/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0290 Replace Fire Station 43 in Seville	HMGP	12/8/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0291 Replace Fire Station 13 in Ormond Beach	HMGP	12/8/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0292 Replace Fire Station 15 in Daytona Beach	HMGP	12/8/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0293 Replace Fire Station 41 in DeLeon Springs	HMGP	12/8/2004	WITH FUNDING	A
H	Volusia County (Unincorporated)	Volusia County Fire Services	Multi	ES	VOL-0294 Replace Fire Station 32 in DeLand	HMGP	12/8/2004	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department	Multi	ES	VOL-0031 To provide emergency power to operate the medical clinics	HMGP	8/1/1999	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department	Multi	ES	VOL-0175 Install a backup generator at the new Health Department building	HMGP	1/1/2002	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department	Multi	PE	VOL-0252 VCHD Public Information Disaster Initiative	HMGP	10/13/2004	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department	Wind	PP	VOL-0324 Harden roof on main Health Dept building	HMGP	Pre-2014	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
	Volusia County (Unincorporated)	Volusia County Health Department - Daytona Clinic	Multi	ES	VOL-0249 Emergency Communications	HMGP	10/13/2004	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department - Daytona Clinic	Multi	ES	VOL-0250 Emergency Backup Power	HMGP	10/13/2004	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department - Daytona Clinic	Multi	ES	VOL-0251 Emergency Prime Mover Vehicle	HMGP	10/13/2004	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department - Daytona Clinic	Multi	ES	VOL-0030 To provide emergency power to operate the medical clinics	HMGP	8/1/1999	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department - DeLand Clinic	Multi	ES	VOL-0253 Emergency Response	HMGP	10/13/2004	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Health Department - Env. Health Lab	Multi	ES	VOL-0029 Provide emergency generator power at Environmental Health Lab	HMGP	8/1/1999	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Private Agencies	Multi	PP	VOL-0026 Develop a countywide contractor licensing program	HMGP	Pre-2014	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Private Agencies	Multi	PP	VOL-0045 Protect United Way Headquarters with generator & window protection	HMGP	Pre-2014	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Private Agencies	Multi	ES	VOL-0132 Fund CERV program	HMGP	Pre-2014	WITH FUNDING	A

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Priority	Jurisdiction	Responsible Organization	Hazard(s)	Mitigation Technique Category	Initiative	Funding	Approved by LMS Working Group	Completion Date	Status
M	Volusia County (Unincorporated)	Volusia County Private Agencies	Flood	S	VOL-0181 Infrastructure placement in Tomoka Estates Subdivision	HMGP	5/21/2004	WITH FUNDING	U
	Volusia County (Unincorporated)	Volusia County Road & Bridge	Flood	S	VOL-0035 Replace Orange Avenue Bridge with Fixed High Level Bridge	HMGP	8/1/1999	WITH FUNDING	A
	Volusia County (Unincorporated)	Volusia County Road & Bridge	Flood	S	VOL-0038 Replace Bridge #794010 (Taylor Road over B-19)	HMGP	8/1/1999	WITH FUNDING	A
M	Volusia County (Unincorporated)	Volusia County Sheriff's Dept	Multi	ES	VOL-0198 Updated 09/10/08 Construct a hardened, centralized evidence storage facility	HMGP	11/1/2002	WITH FUNDING	A

## SECTION 10 – PLAN MAINTENANCE PROCEDURES

### 44 CFR Requirement

#### **44 CFR Part 201.6(c)(4)(i):**

The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.

#### **44 CFR Part 201.6(c)(4)(ii):**

The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

This section of the Plan discusses how the Mitigation Strategy and Mitigation Action Plan will be implemented and how the LMS will be evaluated and enhanced over time. This section also discusses how the public will continue to be involved in a sustained hazard mitigation planning process. It consists of the following three subsections:

- ▶ **Implementation**
- ▶ **Monitoring, Evaluation and Enhancement**
- ▶ **Continued Public Involvement**

### 10.1 IMPLEMENTATION

Each agency, department or other partners participating under the Volusia County Multi-jurisdictional LMS is responsible for implementing specific mitigation actions as prescribed in the Mitigation Action Plan. Every proposed action listed in the Mitigation Action Plan is assigned to a specific “lead” agency or department in order to assign responsibility and accountability and increase the likelihood of subsequent implementation.

In addition to the assignment of a local lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. Volusia County and its participating jurisdictions and partners will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments<sup>1</sup>. When applicable, potential funding sources have been identified for proposed actions listed in the Mitigation Action Plan.

Volusia County will integrate this Mitigation Plan into relevant County government decision making processes or mechanisms. This includes integrating the Mitigation Plan requirements into other local planning documents, processes or mechanisms, such as comprehensive or capital improvement plans, when appropriate. Members of the LMS Working Group will ensure that the goals and strategies of new

<sup>1</sup> A listing of key federal hazard mitigation funding sources can be found in the *Guide to Funding and Technical Assistance Programs*, provided as a separate annex to this Plan.

## SECTION 10: PLAN MAINTENANCE PROCEDURES

and updated local planning documents for their agencies or departments are consistent and do not conflict with the goals and actions of the LMS and will not contribute to increased hazard vulnerability in the County.

Opportunities to integrate the requirements of this Plan into other local planning mechanisms shall continue to be identified through future meetings of the LMS Working Group and through the five-year review process described herein. Although it is recognized that there are many possible benefits to integrating components of this Plan into other local planning mechanisms, the development and maintenance of this stand-alone Mitigation Plan is deemed by the Volusia County LMS Working Group to be the most effective and appropriate method to implement local hazard mitigation actions at this time.

### 10.2 MONITORING, EVALUATION AND ENHANCEMENT

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Periodic revisions and updates of the LMS are required to ensure that the goals of the Plan are kept current and account for potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable federal and state regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to the Mitigation Action Plan.

The Volusia County LMS Working Group will continue to meet at least annually and following any disaster events warranting a reexamination of the mitigation actions being implemented or proposed for future implementation. This will ensure that the Plan is continuously updated to reflect changing conditions and needs within Volusia County. If determined appropriate or as requested, an annual report on the Plan will be developed and presented to the Volusia County Council in order to report progress on the actions identified in the Plan and to provide information on the latest legislative requirements and/or changes to those requirements.

#### 10.2.1 Five (5) Year Plan Review

The Plan will be thoroughly reviewed by the LMS Working Group every five years to determine whether there have been any significant changes in Volusia County that may, in turn, necessitate changes in the types of mitigation actions proposed. New development in identified hazard areas, increased exposure to hazards, the increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the necessary content of the Plan.

The plan review provides Volusia County officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses avoided due to the implementation of specific mitigation measures. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned. Volusia County Emergency Management Services department will be responsible for reconvening the LMS Working Group and conducting the five-year review.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

## SECTION 10: PLAN MAINTENANCE PROCEDURES

- ▶ Do the goals address current and expected conditions?
- ▶ Has the nature or magnitude of risks changed?
- ▶ Are the current resources appropriate for implementing the Plan?
- ▶ Are there implementation problems, such as technical, political, legal or coordination issues with other agencies?
- ▶ Have the outcomes occurred as expected?
- ▶ Did the County and participating agencies and other partners participate in the plan implementation process as assigned?

Following the five-year review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the Volusia County LMS will be submitted to the State Hazard Mitigation Officer at the Florida Division of Emergency Management (FDEM) for final review and approval in coordination with the Federal Emergency Management Agency (FEMA).

### 10.2.2 Disaster Declaration

Following a disaster declaration, the Volusia County LMS will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility of the Volusia County Emergency Management Services department to reconvene the LMS Working Group and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

### 10.2.3 Reporting Procedures

The results of the five-year review will be summarized by the LMS Working Group in a report that will include an evaluation of the effectiveness of the Plan and any required or recommended changes or amendments. The report will also include an evaluation of implementation progress for each of the proposed mitigation actions, identifying reasons for delays or obstacles to their completion along with recommended strategies to overcome them.

### 10.2.4 Plan Amendment Process

Upon the initiation of the amendment process, Volusia County and its participating jurisdictions and partners will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected County departments, residents, and businesses. Information will also be forwarded to the Florida Division of Emergency Management. This information will be disseminated in order to seek input on the proposed amendment(s) for not less than a 45-day review and comment period.

At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the LMS Working Group for final consideration. The committee will review the proposed amendments along with the comments received from other parties, and, if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan to the Volusia County Council within 60 days.

## SECTION 10: PLAN MAINTENANCE PROCEDURES

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered by the LMS Working Group:

- ▶ There are errors, inaccuracies or omissions made in the identification of issues or needs in the Plan;
- ▶ New issues or needs have been identified which are not adequately addressed in the Plan;
- ▶ There has been a change in information, data, or assumptions from those on which the Plan is based.

Upon receiving the recommendation from the LMS Working Group and prior to adoption of the Plan, the County will hold a public hearing if deemed necessary. The Volusia County Council will review the recommendation from the LMS Working Group (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the County Council will take one of the following actions:

- ▶ Adopt the proposed amendments as presented
- ▶ Adopt the proposed amendments with modifications
- ▶ Refer the amendments request back to the LMS Working Group for further revision, or
- ▶ Defer the amendment request back to the LMS Working Group for further consideration and/or additional hearings

### 10.3 CONTINUED PUBLIC INVOLVEMENT

#### 44 CFR Requirement

**44 CFR Part 201.6(c)(4)(iii):**

The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process

Public participation is an integral component to the mitigation planning process and will continue to be essential as this Plan evolves over time. As described above, significant changes or amendments to the Plan shall require a public hearing prior to any adoption procedures.

Other efforts to involve the public in the maintenance, evaluation and revision process will be made as necessary. These efforts may include:

- ▶ Advertising meetings of the LMS Working Group in local newspapers, public bulletin boards and/or County office buildings
- ▶ Designating willing and voluntary citizens and private sector representatives as official members of the LMS Working Group
- ▶ Utilizing local media to update the public of any maintenance and/or periodic review activities taking place
- ▶ Utilizing the Volusia County website to advertise any maintenance and/or periodic review activities taking place, and
- ▶ Keeping copies of the Plan in public libraries

## APPENDIX A: PLAN ADOPTIONS

[Volusia County Emergency Management to add adoptions to this section once finalized by jurisdictions]

## APPENDIX B: BYLAWS OF “VOLUSIA PREPARES”

### Bylaws of “Volusia Prepares” The Volusia County Local Mitigation Strategy Steering Committee

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#### ARTICLE I: PURPOSES OF THE TASK FORCE

The purpose of the Volusia County Local Mitigation Strategy Task Force, otherwise known as “Volusia Prepares”, is to decrease the vulnerability of the citizens, governments, businesses and institutions of Volusia County to the future human, economic and environmental costs of natural, technological, and societal disasters. The Task Force will develop, monitor, implement, and maintain a comprehensive plan for hazard mitigation which will be intended to accomplish this purpose.

#### ARTICLE II: MEMBERSHIP

Participation in Volusia Prepares is voluntary by all entities. Membership in Volusia Prepares is open to all jurisdictions, organizations and individuals supporting its purposes

#### ARTICLE III: ORGANIZATIONAL STRUCTURE

The organizational structure of Volusia Prepares shall consist of a Steering Committee and subcommittees as deemed necessary by the Steering Committee.

##### **A. The Steering Committee**

Volusia Prepares shall be guided by a Steering Committee consisting of designated representatives of the following:

- One representative from the government of Volusia County and each participating incorporated municipality,
- One representative from organizations and associations representing key business, industry, and community interest groups of Volusia County, and
- Other such individuals appointed by a majority vote of the Steering Committee.

Members of the Steering Committee will be designated by formal appointment or other action to serve as the official representative and spokesperson for the jurisdiction or organization regarding the activities and decisions of Volusia Prepares. To maintain good standing, members of the Steering Committee must not have more than two unexcused absences from meetings during the course of a year. Three or more unexcused absences during the course of one calendar year will result in HMGP grant funding ineligibility for those jurisdiction(s) during the next Presidentially declared disaster.

##### **B. Subcommittees**

Volusia Prepares may have permanent and/or temporary subcommittees as deemed necessary by the Steering Committee. Membership in the subcommittees is not restricted. There are no requirements for individuals to maintain good standing as members of a permanent or temporary subcommittee.

##### **C. Program Staff**

The Volusia County Emergency Management Division, or other agency as so designated by the Steering Committee, will serve as the program staff for Volusia Prepares, and assist in the coordination and support of Volusia Prepares activities.

## APPENDIX B: BYLAWS OF "VOLUSIA PREPARES"

### ARTICLE IV: OFFICERS

Any member in good standing of the Steering Committee is eligible for election as an officer. The Steering Committee will have a chair elected by a majority vote of a quorum of the members. The Steering Committee will also elect by majority vote a vice chair. Representatives of both local government and any participating private sector organizations will be eligible for election as an officer. Each will serve a term of one year, and be eligible for re-election for an unlimited number of terms. The chair and vice chair of the Steering Committee are also considered to be chair and vice chair of Volusia Prepares.

The chair of the Steering Committee will preside at each meeting of the Steering Committee, as well as establish temporary subcommittees and assign personnel to them. The vice chair will fulfill the duties and responsibilities of the chair in his or her absence.

The chair of each permanent or temporary subcommittee will be designated from the members in good standing of the Steering Committee by its chair, and will serve at the pleasure of the chair of the Steering Committee.

### ARTICLE V: RESPONSIBILITIES

#### **A. Steering Committee**

The Steering Committee will be responsible for oversight and coordination of all actions and decisions by the Task Force, and is solely responsible for formal actions in the name of Volusia Prepares, including the release of reports, development of resolutions, issuance of position papers, and similar activities. The Steering Committee makes assignments to the subcommittees, coordinates their work, and takes action on their recommendations. Their goal is to make Volusia County disaster resistant by preventing or reducing the personal and economic loss from natural or man-made hazards through a partnership between government, businesses, organizations, associations, and citizens.

#### Objectives:

1. Keep the Volusia County Local Mitigation Strategy (LMS) document current (incorporating new projects, objectives, and goals).
2. Develop and maintain overall policies and procedures and integrate priorities of mitigation efforts.
3. Facilitate comprehensive effectiveness by coordinating with subcommittees.
4. Vote on proposed action plans and initiatives.
5. Develop a strategy to constantly identify and recruit new partners.
6. Develop a systematic method to share knowledge and market the need for being disaster resistant.
7. Promote accomplishments to elected officials and community.

#### **B. Subcommittees**

If established by the Steering Committee, subcommittees will have responsibilities as assigned by the Steering Committee members.

## APPENDIX B: BYLAWS OF "VOLUSIA PREPARES"

### ***C. Program Staff***

Technical, clerical and other types of support activities to the Steering Committee and subcommittees will be provided through the Volusia County Emergency Management Division or other agency or organizational staff as designated by the Steering Committee. The Steering Committee will also designate an agency of Volusia County to serve as the legal representative and agent of Volusia Prepares, and to be empowered under County statutes to accept and disburse funds, enter into contracts, hire staff, and take such other actions as necessary in support of, or for the benefit of, the Task Force. Other jurisdictions and organizations may also provide such services on a voluntary basis upon request of the chair of the Steering Committee.

## **ARTICLE VI: ACTIONS BY THE TASK FORCE**

### ***A. Authority for Actions***

Only the Steering Committee has the authority to take final actions in the name of Volusia Prepares. Actions by subcommittees or program staff are not considered as final until affirmed by action of the Steering Committee.

### ***B. Meetings, Voting and Quorum***

Meetings of the Steering Committee and its subcommittees will be conducted in accord with Robert's Rules of Order, if and when deemed necessary by chair of the meeting. Regular meetings of the Steering Committee will be scheduled at least quarterly with a minimum of 10 working days' notice. Subcommittees will meet at least quarterly prior to Steering Committee meetings, or more frequently as deemed necessary, at the discretion of their chairperson.

All final actions and decisions made in the name of Volusia Prepares will be by affirmative vote of a quorum of the Steering Committee. A quorum shall be 50 percent of the members of the Steering Committee in good standing at the time of the vote. Each member of the Steering Committee will have one vote. Voting by proxy, written or otherwise, is permitted.

### ***C. Special Votes***

Special votes may be taken under emergency situations or when there are other extenuating circumstances as determined by the chair and/or vice chair of the Steering Committee. Special votes may be made by telephone, email, webinar, or any electronic means, or first class mail, and shall be in accord with all applicable quorum rules for such actions.

### ***D. Public Hearings***

When required by statute or the policies of Volusia County, or when deemed necessary by the Steering Committee, a public hearing regarding actions under consideration for implementation by Volusia Prepares will be held.

### ***E. Documentation of Actions***

All meetings and other forms of action by the Steering Committee and permanent subcommittees (if established) will be documented and made available for inspection by the public.

## APPENDIX B: BYLAWS OF "VOLUSIA PREPARES"

### **ARTICLE VII: ADOPTION OF AMENDMENTS AND CHANGES TO THE BYLAWS AND "VOLUSIA PREPARES" LOCAL MITIGATION STRATEGY DOCUMENT**

The Bylaws of Volusia Prepares and the "*Volusia Prepares*" Local Mitigation Strategy document may be adopted and/or amended by a two-thirds majority vote of the members in good standing of the Steering Committee at any time. All proposed changes to the bylaws and "*Volusia Prepares*" Local Mitigation Strategy document will be provided to each member of the Steering Committee prior to voting on the proposed changes. Routine changes, additions, deletions, and deferment of mitigation initiatives and any other changes to the document may be made at any time by majority vote. Voting may be by telephone, email, webinar, or any electronic means, or first class mail. A 45-day public review and comment period shall apply to the five-year FEMA required update of the "*Volusia Prepares*" LMS Document.

### **ARTICLE VIII: DISSOLUTION OF THE TASK FORCE**

The Task Force may be dissolved by affirmative vote of 100% of the members in good standing of the Steering Committee at the time of the vote, by order of a court of competent jurisdiction, and/or by instruction of the Volusia County governing body. At the time of dissolution, all remaining documents, records, equipment and supplies belonging to the Task Force will be transferred to Volusia County for disposition.

## APPENDIX C: LOCAL MITIGATION PLAN CROSSWALK

Included below is a link to the Florida Local Mitigation Strategy (LMS) Crosswalk excel document, which incorporates the National Flood Insurance Program's (NFIP) Community Rating System (CRS) into the Local Mitigation Strategy planning process. The information in this document (including all tabs) is subject to state review and can be found at the link below.

[Link to Crosswalk](#)

## APPENDIX D: MEETING INFORMATION

### Meeting Information

This section of the Volusia Local Mitigation Strategy includes documentation (agendas, sign in sheets, other items) for the meetings held as part of the planning process. The planning team held three meetings, which are summarized below:

- June 11, 2014: LMS Working Group Meeting #1
  - Open to public
- August 13, 2014: Public Meeting
  - Open to public
- September 10, 2014: LMS Working Group Meeting #2
  - Open to public

Documentation for these meetings is found on the following pages of this appendix, including:

- Sign-In Sheets
- Agendas
- Public Participation Forms
- Press Releases







## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

This section of the Local Mitigation Strategy cross-references the locations of all critical facilities within Volusia County and its jurisdictions with environmental layers pertaining to the following hazard layers:

- Flood Zone
- Fire Risk Zone
- Storm Surge Zone
- Evacuation Zone
- Wind Risk
- Tornadoes (1960-2014)

There are approximately 400 critical facilities within Volusia County and its jurisdictions. The critical facilities covered in this report cover the following types of facilities.

- Administrative Buildings (non-city hall)
- Airports
- City Halls
- Elderly Care Facilities
- Emergency Operations Center (Volusia County EOC)
- Fire Stations
- Industrial Buildings
- Medical Facilities (clinics not included)
- Police Stations
- Schools and Colleges
- Utilities

Also covered in this section are **Water and Sewage Treatment Facilities**, **State Facilities** within flood zones, and **Lift Stations** as provided by county jurisdictions.

The tables on the following six pages depict the critical facilities, by jurisdiction and facility type, that are located within Volusia County, Florida. Each critical facility is cross-referenced with environmental hazard zones to depict risk for the natural hazards listed above.

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 1)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
OCEAN CENTER	101 N ATLANTIC AVENUE	ADMIN	DAYTONA BEACH	X	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
SALVATION ARMY	1555 LPGA BLVD	ADMIN	DAYTONA BEACH	X	High	None	None	96-100	Outside 1.00 Miles
DAYTONA BEACH INTERNATIONAL AIRPORT	700 CATALINA DR	AIRPORT	DAYTONA BEACH	A	Low	None	None	101-105	Within 1.00 Miles
DAYTONA BEACH CITY HALL	301 S RIDGEWOOD AVE	CITY HALL	DAYTONA BEACH	X	Low	Category 4	Zone E	101-105	Within 0.25 Miles
DAYTONA BEACH INTL FIRE STATION	2316 BELLEVUE AV	FIRE STATION	DAYTONA BEACH	X	Low	None	None	101-105	Within 0.50 Miles
DAYTONA BEACH STATION 1	301 BEACH ST	FIRE STATION	DAYTONA BEACH	AE	None	Category 3	Zone C	101-105	Within 0.25 Miles
DAYTONA BEACH STATION 2	126 BOTEFUHR AV	FIRE STATION	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Within 1.00 Miles
DAYTONA BEACH STATION 3	945 N HALIFAX AV	FIRE STATION	DAYTONA BEACH	A	Low	Category 4	Zone A	101-105	Outside 1.00 Miles
DAYTONA BEACH STATION 4/MAINTENANCE	1675 MASON AVE	FIRE STATION	DAYTONA BEACH	X	Very High	None	None	101-105	Within 1.00 Miles
DAYTONA BEACH STATION 5	627 N NOVA RD	FIRE STATION	DAYTONA BEACH	A	Very High	Category 4	Zone E	101-105	Within 0.50 Miles
DAYTONA BEACH STATION 6	2020 BEVILLE RD	FIRE STATION	DAYTONA BEACH	AE	High	None	None	101-105	Outside 1.00 Miles
DAYTONA BEACH STATION 7	2545 LPGA BLVD	FIRE STATION	DAYTONA BEACH	X	High	None	None	96-100	Outside 1.00 Miles
ALUMA SHIELD - DAYTONA BEACH	405 FENTRESS BLVD	INDUSTRIAL	DAYTONA BEACH	A	High	None	None	101-105	Within 1.00 Miles
APOGEE PLASTIC	1845 HOLSONBACK DRIVE	INDUSTRIAL	DAYTONA BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
CRANE CAMS	530 FENTRESS BOULEVARD	INDUSTRIAL	DAYTONA BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
MARTIN MARIETTA - SIMULATION	1800 W INTL SPDWY	INDUSTRIAL	DAYTONA BEACH	X	Low	None	None	101-105	Within 0.25 Miles
FLORIDA HOSPITAL MEMORIAL	301 MEMORIAL MED. PkY	MEDICAL	DAYTONA BEACH	A	Low	None	None	96-100	Within 0.10 Miles
HALIFAX MEDICAL CENTER	303 N CLYDE MORRIS BLVD	MEDICAL	DAYTONA BEACH	A	Low	None	None	101-105	Within 0.10 Miles
HUMANA HOSPITAL DAYTONA BEACH	1500 BEVILLE ROAD	MEDICAL	DAYTONA BEACH	A	Low	Category 4	Zone E	101-105	Within 0.50 Miles
DAYTONA BEACH POLICE/ SUBSTATION	510 HARVEY AVE	POLICE	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Within 1.00 Miles
DAYTONA BEACH POLICE HEADQUARTERS	129 VALOR BLVD	POLICE	DAYTONA BEACH	A	Very High	None	None	96-100	Outside 1.00 Miles
EAST VOLUSIA COUNTY JUVENILE	440 1/2 S. BEACH ST	POLICE	DAYTONA BEACH	AE	Low	Category 3	Zone C	101-105	Within 0.25 Miles
FEDERAL BUREAU OF INVESTIGATION	444 SEABREEZE BLVD	POLICE	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Outside 1.00 Miles
FL DEPT OF LAW ENFORCEMENT	810 FENTRESS CT	POLICE	DAYTONA BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
FL NATIONAL GUARD	405 BASIN ST	POLICE	DAYTONA BEACH	X	Low	Category 3	Zone A	101-105	Within 0.25 Miles
HOMICIDE INVESTIGATIVE UNIT	S BEACH ST - LOOMIS AVE	POLICE	DAYTONA BEACH	A	Low	Category 3	Zone C	101-105	Within 0.10 Miles
VOLUSIA COUNTY BEACH PATROL	REVILO BLVD	POLICE	DAYTONA BEACH	A	Low	Category 4	Zone A	101-105	Within 0.25 Miles
CST TEAM LOCATION	717 S RIDGEWOOD	POLICE	DAYTONA BEACH	X	Very High	Category 3	Zone C	101-105	Within 0.25 Miles
ADVANCED TECHNOLOGY CENTER	1770 TECHNOLOGY BLVD	SCHOOL	DAYTONA BEACH	X	Low	None	None	96-100	Within 1.00 Miles
BETHUNE COOKMAN COLLEGE	640 M.M. BETHUNE BLVD	SCHOOL	DAYTONA BEACH	A	Low	Category 4	Zone E	101-105	Within 0.50 Miles
BONNER ELEMENTARY & CHILES ACAD.	868 GEORGE ENGRAM BV	SCHOOL	DAYTONA BEACH	A	Low	Category 4	Zone E	101-105	Within 0.10 Miles
CAMPBELL MIDDLE SCHOOL	625 S KEECH STREET	SCHOOL	DAYTONA BEACH	A	Low	Category 4	Zone E	101-105	Within 0.25 Miles
CHAMPION ELEMENTARY SCHOOL	921 TOURNAMENT DRIVE	SCHOOL	DAYTONA BEACH	A	Low	None	None	96-100	Within 0.50 Miles
CYPRESS STREET SCHOOL	900 CYPRESS STREET	SCHOOL	DAYTONA BEACH	A	Low	Category 4	Zone E	101-105	Within 0.10 Miles
DAVID HINSON SR MIDDLE SCHOOL	1860 CLYDE MORRIS BLVD	SCHOOL	DAYTONA BEACH	X	Low	None	None	96-100	Within 1.00 Miles
DAYTONA BEACH CHRISTIAN SCHOOL	1850 CLYDE MORRIS BLVD	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Within 0.10 Miles
DAYTONA STATE COLLEGE	1200 W INTL SPEEDWAY	SCHOOL	DAYTONA BEACH	A	Low	None	None	101-105	Within 0.10 Miles
EASTER SEALS CHARTER SCHOOL	1219 DUNN AVENUE	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Within 0.25 Miles
EMBRY RIDDLE AERONAUTICAL UNIV.	600 S CLYDE MORRIS BV	SCHOOL	DAYTONA BEACH	A	Low	None	None	101-105	Within 0.25 Miles
FATHER LOPEZ HIGH SCHOOL	3918 LPGA BOULEVARD	SCHOOL	DAYTONA BEACH	A	Low	None	None	101-105	Outside 1.00 Miles
HALIFAX ACADEMY	275 N WILLIAMSON BLVD	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Within 0.50 Miles
INDIGO CHRISTIAN SCHOOL	401 N WILLIAMSON BLVD	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Within 1.00 Miles
KINDER CARE LEARNING CENTER	1320 BEVILLE ROAD	SCHOOL	DAYTONA BEACH	X	Very High	None	None	101-105	Within 1.00 Miles
LILLIES OF THE FIELD	201 SAN JUAN AVENUE	SCHOOL	DAYTONA BEACH	X	Low	Category 3	Zone E	101-105	Within 0.50 Miles
LIVING TRUTH CHILD DEVELOPMENT	FREMONT AVE - MARION ST	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone E	101-105	Within 0.50 Miles
LONGSTREET ELEMENTARY SCHOOL	2745 S PENINSULA DRIVE	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Outside 1.00 Miles
MAINLAND HIGH SCHOOL	1255 W INTL SPEEDWAY	SCHOOL	DAYTONA BEACH	A	Low	None	None	101-105	Within 0.10 Miles
MOUNT CALVARY ACADEMY	700 BELLEVUE AVENUE	SCHOOL	DAYTONA BEACH	AE	Low	Category 4	Zone E	101-105	Within 0.50 Miles
OPEN BIBLE CHRISTIAN	1311 CENTER AVENUE	SCHOOL	DAYTONA BEACH	X	Very High	Category 5	Zone E	101-105	Within 0.50 Miles
ORTONA ELEMENTARY SCHOOL	1265 N GRANDVIEW AVE	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Outside 1.00 Miles
OUR LADY OF LOURDES SCHOOL	1014 N HALIFAX AVENUE	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Outside 1.00 Miles
PALM TERRACE ELEMENTARY SCHOOL	1825 DUNN AVENUE	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Within 1.00 Miles
RIVERVIEW LEARNING CENTER	RIVERVIEW BOULEVARD	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Outside 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 2)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
SEABREEZE HIGH SCHOOL	2700 N OLEANDER AVE	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone A	101-105	Outside 1.00 Miles
ST PAULS CATHOLIC SCHOOL	317 MULLALLY STREET	SCHOOL	DAYTONA BEACH	X	Low	Category 4	Zone E	101-105	Within 0.50 Miles
TURIE T SMALL ELEMENTARY SCHOOL	800 SOUTH STREET	SCHOOL	DAYTONA BEACH	A	Low	Category 4	Zone E	101-105	Within 0.50 Miles
VOLUSIA COUNTY MARINE INSTITUTE	1420 MASON AVENUE	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Within 1.00 Miles
VOLUSIA COUNTY SCHOOL DISTRICT	3750 OLSON DR	SCHOOL	DAYTONA BEACH	X	Low	None	None	101-105	Outside 1.00 Miles
WESTSIDE ELEMENTARY SCHOOL	1210 JIMMY ANN DRIVE	SCHOOL	DAYTONA BEACH	A	Low	None	None	101-105	Outside 1.00 Miles
AT&T - CELLULAR ONE AIRPORT	950 WILLIAMSON BLVD	UTILITY	DAYTONA BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
BEACH SERVICES	145 DUNLAWTON	ADMIN	DB SHORES	X	Low	Category 3	Zone A	101-105	Outside 1.00 Miles
DAYTONA BEACH SHORES CITY HALL	3050 S ATLANTIC AVE	CITY HALL	DB SHORES	A	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
DAYTONA BEACH SHORES STATION 77	3050 S ATLANTIC AVE	FIRE STATION	DB SHORES	X	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
MASTER LIFE STATION	SEAWAY AVE	INDUSTRIAL	DB SHORES	A	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
DAYTONA BEACH SHORES POLICE DEPT	3050 S ATLANTIC AVE	POLICE	DB SHORES	X	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
PUBLIC SAFETY COMPLEX	ESPERANZA AVENUE	POLICE	DB SHORES	A	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
DEBARY CITY HALL	16 COLUMBA RD	CITY HALL	DEBARY	X	Very High	None	None	96-100	Within 1.00 Miles
DEBARY STATION 33	93 S US HWY 17/92	FIRE STATION	DEBARY	X	Very High	None	None	96-100	Within 1.00 Miles
DEBARY PLANTATION CLUB	312 PLANTATION CLUB DR	INDUSTRIAL	DEBARY	A	High	None	None	96-100	Outside 1.00 Miles
WEST VOLUSIA INTERCO LOC 1	COLBURN DRIVE	INDUSTRIAL	DEBARY	A	Very High	None	None	96-100	Outside 1.00 Miles
COMMUNITY LEARNING CENTER WEST	TORONTO STREET	SCHOOL	DEBARY	A	High	None	None	96-100	Within 1.00 Miles
DEBARY ELEMENTARY SCHOOL	88 W HIGHBANKS ROAD	SCHOOL	DEBARY	X	High	None	None	96-100	Outside 1.00 Miles
READING EDGE ACADEMY	2975 ENTERPRISE ROAD	SCHOOL	DEBARY	X	Very High	None	None	96-100	Within 1.00 Miles
FLORIDA POWER - DE BARY POWER PLANT	WEST HIGHBANKS ROAD	UTILITY	DEBARY	A	Low	None	None	96-100	Outside 1.00 Miles
DELAND AIRPORT AND ALUMA SHIELD	1777 LANGLEY AVENUE	AIRPORT	DELAND	A	Low	None	None	96-100	Within 0.25 Miles
DELAND CITY HALL	120 S FLORIDA AVE	CITY HALL	DELAND	X	Low	None	None	96-100	Within 0.50 Miles
DELAND STATION 81	205 HOWRY AVE	FIRE STATION	DELAND	X	Low	None	None	96-100	Within 0.50 Miles
DELAND STATION 82	257 W INTL SPDWY BLVD	FIRE STATION	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
DELAND STATION 83	1655 E TAYLOR RD	FIRE STATION	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
RINKER MATERIALS CORP - DELAND	411 N BOUNDARY AVE	INDUSTRIAL	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
SUBURBAN PROPANE - DELAND	425 NORTH ADELLE AVE	INDUSTRIAL	DELAND	X	Low	None	None	96-100	Within 1.00 Miles
TECHNETICS, INTELLITEC + MEMTEC	1600 INDUSTRIAL DRIVE	INDUSTRIAL	DELAND	A	Low	None	None	96-100	Within 0.50 Miles
EVAC AMBULANCE STATION 5	257 W INTL SPDWY BLVD	MEDICAL	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
FISH MEMORIAL HOSPITAL AT DELAND	1055 SAXON BOULEVARD	MEDICAL	DELAND	X	Low	None	None	96-100	Within 0.10 Miles
SHERWOOD MEDICAL	2010 INTL SPEEDWAY BLVD	MEDICAL	DELAND	A	Low	None	None	96-100	Within 1.00 Miles
WEST VOLUSIA MEMORIAL HOSPITAL	701 W PLYMOUTH AVE	MEDICAL	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
DELAND POLICE DEPT	219 W HOWRY AVE	POLICE	DELAND	X	Low	None	None	96-100	Within 0.50 Miles
FHP TROOP D DISTRICT 3	1551 E INTL SPDWY BLVD	POLICE	DELAND	X	Low	None	None	96-100	Within 0.10 Miles
FL DOT DISTRICT 5 ADMINISTRATION CTR	719 S WOODLAND BLVD	POLICE	DELAND	X	Low	None	None	96-100	Within 0.25 Miles
FL NATIONAL GUARD - BATTERY B 1-265	401 S ALABAMA AVE	POLICE	DELAND	X	Low	None	None	96-100	Within 0.25 Miles
BLUE LAKE ELEMENTARY SCHOOL	282 N BLUE LAKE AVENUE	SCHOOL	DELAND	X	Low	None	None	96-100	Within 1.00 Miles
BOSTON AVENUE CHARTER	340 N BOSTON AVENUE	SCHOOL	DELAND	X	Low	None	None	96-100	Within 0.10 Miles
CASA MONTESSORI	217 N STONE STREET	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 1.00 Miles
CHILDRENS HOUSE MONTESSORI SCHOOL	E PENNSYLVANIA AVENUE	SCHOOL	DELAND	X	Low	None	None	96-100	Within 0.10 Miles
CITRUS GROVE ELEMENTARY SCHOOL	729 HAZEN ROAD	SCHOOL	DELAND	X	Very High	None	None	96-100	Outside 1.00 Miles
DELAND HIGH SCHOOL	800 N HILL AVENUE	SCHOOL	DELAND	A	Low	None	None	96-100	Within 0.25 Miles
DELAND MIDDLE SCHOOL	1400 AQUARIUS DRIVE	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 0.50 Miles
EASTER SEALS CHARTER SCHOOL	2219 S WOODLAND BV	SCHOOL	DELAND	X	Low	None	None	96-100	Within 1.00 Miles
EUCLID AVENUE LEARNING CENTER	409 W EUCLID AVENUE	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 1.00 Miles
FIRST PRESBYTERIAN DAY SCHOOL	724 N WOODLAND BV	SCHOOL	DELAND	X	Low	None	None	96-100	Within 1.00 Miles
FREEDOM ELEMENTARY SCHOOL	1335 S BLUE LAKE AVENUE	SCHOOL	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
FUTURE SCHOOL SITE 2	N SUMMITT AVENUE	SCHOOL	DELAND	X	Low	None	None	96-100	Within 1.00 Miles
RICHARD MILBURN ACADEMY WEST	913 E NEW YORK AVENUE	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 0.50 Miles
ST BARNABAS EPISCOPAL SCHOOL	322 W MICHIGAN AVENUE	SCHOOL	DELAND	X	Low	None	None	96-100	Within 1.00 Miles
ST PETERS CATHOLIC SCHOOL	421 W NEW YORK AVENUE	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 1.00 Miles
STARKE ELEMENTARY SCHOOL	730 S PARSONS AVENUE	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 0.25 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 3)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
STETSON BAPTIST CHRISTIAN SCHOOL	1025 W MINNESOTA AVE	SCHOOL	DELAND	X	Low	None	None	96-100	Outside 1.00 Miles
TWINKLE STAR MONTESSORI	238 S AMELIA AVENUE	SCHOOL	DELAND	X	Very High	None	None	96-100	Within 0.25 Miles
UTILITIES	300 E NEW HAMPSHIRE AV	UTILITY	DELAND	X	Very High	None	None	96-100	Within 0.50 Miles
DELTONA PUBLIC WORKS DEPARTMENT	201 HOWLAND BLVD	ADMIN	DELTONA	AE	High	None	None	96-100	Outside 1.00 Miles
DELTONA WATER DEPARTMENT	255 ENTERPRISE ROAD	ADMIN	DELTONA	X	Very High	None	None	96-100	Within 1.00 Miles
DELTONA CITY HALL	2345 PROVIDENCE BLVD	CITY HALL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
DELTONA STATION 61	1685 PROVIDENCE BLVD	FIRE STATION	DELTONA	X	Low	None	None	96-100	Within 1.00 Miles
DELTONA STATION 62	320 DIAMOND ST	FIRE STATION	DELTONA	X	Very High	None	None	96-100	Within 1.00 Miles
DELTONA STATION 63	2147 HOWLAND BLVD	FIRE STATION	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
DELTONA STATION 64	236 FORT SMITH BLVD	FIRE STATION	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
DELTONA STATION 65	2983 HOWLAND BLVD	FIRE STATION	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
FIRE DEPARTMENT LOGISTICS	1362 LOMBARDY DRIVE	FIRE STATION	DELTONA	X	Low	None	None	96-100	Within 1.00 Miles
DELTONA NORTH FACILITY	WOLF PACK RUN	INDUSTRIAL	DELTONA	A	High	None	None	96-100	Outside 1.00 Miles
OSTEEN C & D DISPOSAL FACILITY	KEEKHAUL ROAD	INDUSTRIAL	DELTONA	A	Low	None	None	96-100	Outside 1.00 Miles
DELTONA PARKS DEPARTMENT	1236 SAXON BLVD	MEDICAL	DELTONA	X	Low	None	None	96-100	Within 0.50 Miles
VOLUSIA CO SHERIFFS OFFICE	1691 PROVIDENCE BLVD	POLICE	DELTONA	X	Low	None	None	96-100	Within 1.00 Miles
DELTONA 7TH DAY ADVENTIST SCHOOL	1725 CATALINA BLVD	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
DELTONA CHRISTIAN SCHOOL	1200 PROVIDENCE BLVD	SCHOOL	DELTONA	X	Very High	None	None	96-100	Within 1.00 Miles
DELTONA HIGH SCHOOL	100 WOLF PACK RUN	SCHOOL	DELTONA	X	Low	None	None	96-100	Outside 1.00 Miles
DELTONA LAKES ELEMENTARY SCHOOL	2022 ADELIA BOULEVARD	SCHOOL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
DELTONA MIDDLE SCHOOL	250 ENTERPRISE ROAD	SCHOOL	DELTONA	X	Very High	None	None	96-100	Within 1.00 Miles
DISCOVERY ELEMENTARY SCHOOL	975 ABAGAIL DRIVE	SCHOOL	DELTONA	X	Very High	None	None	96-100	Within 0.25 Miles
FRIENDSHIP ELEMENTARY SCHOOL	2746 FULFORD STREET	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
FUTURE HIGH SCHOOL SITE	AUSTIN AVENUE	SCHOOL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
FUTURE MIDDLE SCHOOL SITE	HAULOVER BOULEVARD	SCHOOL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
FUTURE SCHOOL SITE 3	UTICA STREET	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
FUTURE SCHOOL SITE 6	IRONDALE STREET	SCHOOL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
GALAXY MIDDLE SCHOOL	2400 EUSTACE AVENUE	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
HERITAGE MIDDLE SCHOOL	1001 PARNELL COURT	SCHOOL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
PINE RIDGE HIGH SCHOOL	926 HOWLAND BLVD	SCHOOL	DELTONA	X	High	None	None	96-100	Outside 1.00 Miles
PRIDE ELEMENTARY SCHOOL	1100 LEARNING LANE	SCHOOL	DELTONA	X	Low	None	None	96-100	Outside 1.00 Miles
SPIRIT ELEMENTARY SCHOOL	1500 MEADOWLARK DR	SCHOOL	DELTONA	X	High	None	None	96-100	Within 1.00 Miles
SUNRISE ELEMENTARY SCHOOL	3155 PHONETIA DRIVE	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
TIMBERCREST ELEMENTARY SCHOOL	2401 EUSTACE AVENUE	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
TRINITY CHRISTIAN ACADEMY SCHOOL	17001 ADDISON ROAD	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
VOLUSIA COUNTY CHRISTIAN ACADEMY	2300 HOWLAND BLVD	SCHOOL	DELTONA	X	Very High	None	None	96-100	Outside 1.00 Miles
SOUTHERN STATES UTILITIES LOC 1	N FIRWOOD DRIVE	UTILITY	DELTONA	A	High	None	None	96-100	Outside 1.00 Miles
SOUTHERN STATES UTILITIES LOC 2	ELKCAM BOULEVARD	UTILITY	DELTONA	A	Very High	None	None	96-100	Outside 1.00 Miles
SOUTHERN STATES UTILITIES LOC 3	JESSAMINE COURT	UTILITY	DELTONA	AE	None	None	None	96-100	Outside 1.00 Miles
SOUTHERN STATES UTILITIES LOC 4	COURTLAND BLVD	UTILITY	DELTONA	A	High	None	None	96-100	Outside 1.00 Miles
MASSEY RANCH AIRPARK	635 AIR PARK ROAD	AIRPORT	EDGEWATER	X	High	Category 3	Zone C	101-105	Outside 1.00 Miles
EDGEWATER CITY HALL	104 N RIVERSIDE DR	CITY HALL	EDGEWATER	AE	Very High	Category 2	Zone C	101-105	Within 0.10 Miles
EDGEWATER STATION 55	106 RHODE ISLAND ST	FIRE STATION	EDGEWATER	X	Very High	Category 4	Zone D	101-105	Within 0.50 Miles
EDGEWATER STATION 57	2628 HIBISCUS DR	FIRE STATION	EDGEWATER	X	High	Category 4	Zone D	101-105	Outside 1.00 Miles
CORONADO PAINT	308 OLD COUNTY ROAD	INDUSTRIAL	EDGEWATER	X	Very High	Category 3	Zone C	101-105	Within 1.00 Miles
EDGEWATER POLICE DEPT	135 E PARK AVE	POLICE	EDGEWATER	A	Very High	Category 3	Zone C	101-105	Within 0.25 Miles
DISCOVERY DAYS INST OF LEARNING	227 N RIDGEWOOD AVE	SCHOOL	EDGEWATER	X	Very High	Category 3	Zone C	101-105	Within 0.25 Miles
EDGEWATER PUBLIC SCHOOL	801 S OLD COUNTY ROAD	SCHOOL	EDGEWATER	X	Very High	Category 3	Zone C	101-105	Within 1.00 Miles
INDIAN RIVER ELEMENTARY SCHOOL	650 ROBERTS ROAD	SCHOOL	EDGEWATER	X	Low	Category 4	Zone D	101-105	Outside 1.00 Miles
LITTLE EXPLORERS MONTESSORI SCHOOL	410 N RIDGEWOOD AVE	SCHOOL	EDGEWATER	X	Very High	Category 3	Zone C	101-105	Within 0.10 Miles
HOLLY HILL CITY HALL	1065 RIDGEWOOD AVE	CITY HALL	HOLLY HILL	X	Low	Category 5	Zone E	101-105	Outside 1.00 Miles
HOLLY HILL STATION 96	1020 DAYTONA AV	FIRE STATION	HOLLY HILL	X	Low	Category 4	Zone E	101-105	Outside 1.00 Miles
WIDMAIER OIL	644 CARSWELL AVENUE	INDUSTRIAL	HOLLY HILL	AE	Low	Category 4	Zone E	101-105	Within 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 4)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
CITT HALL ANNEX	1066 RIDGEWOOD AVE	OTHER-ADMIN	HOLLY HILL	A	Low	Category 5	Zone E	101-105	Outside 1.00 Miles
YMCA	1046 DAYTONA AVE	OTHER-ADMIN	HOLLY HILL	X	Low	Category 4	Zone E	101-105	Outside 1.00 Miles
SICA HALL	1065 DAYTONA AVE	OTHER-ADMIN	HOLLY HILL	X	Low	Category 4	Zone E	101-105	Outside 1.00 Miles
FLORIDA HEALTH CARE PLANS MED. FAC.	1360 RIDGEWOOD AVE	OTHER-ADMIN	HOLLY HILL	A	Low	Category 4	Zone E	101-105	Outside 1.00 Miles
EVAC EAST SIDE HUB - AMB STATION 1	112 CARSWELL AVE	MEDICAL	HOLLY HILL	AE	Low	Category 4	Zone E	101-105	Within 0.50 Miles
EVAC AMBULANCE SVC P01	CAREWELL AVE	MEDICAL	HOLLY HILL	A	Low	Category 4	Zone E	101-105	Within 0.50 Miles
HOLLY HILL POLICE DEPT	1065 RIDGEWOOD AVE	POLICE	HOLLY HILL	A	Low	Category 5	Zone E	101-105	Outside 1.00 Miles
VOLUSIA COUNTY SHERIFF DIST. 3	N NOVA RD - 3RD STREET	POLICE	HOLLY HILL	A	Very High	Category 4	Zone E	101-105	Within 0.10 Miles
HOLLY HILL ELEMENTARY SCHOOL	1500 CENTER AVENUE	SCHOOL	HOLLY HILL	A	Very High	Category 4	Zone E	101-105	Outside 1.00 Miles
TRINITY LUTHERAN SCHOOL	1205 RIDGEWOOD AVE	SCHOOL	HOLLY HILL	X	Low	Category 4	Zone E	101-105	Outside 1.00 Miles
AT&T - CELLULAR ONE HOLLY HILL	400 CARSWELL AVENUE	UTILITY	HOLLY HILL	AE	Low	Category 4	Zone E	101-105	Within 1.00 Miles
LAKE HELEN CITY HALL	327 S LAKEVIEW DR	CITY HALL	LAKE HELEN	X	Very High	None	None	96-100	Outside 1.00 Miles
LAKE HELEN STATION 35	630 W MAIN ST	FIRE STATION	LAKE HELEN	X	Very High	None	None	96-100	Outside 1.00 Miles
LAKE HELEN POLICE DEPT	493 SOUTH LAKEVIEW DR	POLICE	LAKE HELEN	X	Low	None	None	96-100	Outside 1.00 Miles
CENTRAL FELLOWSHIP CHRISTIAN ACAD.	E KICKLIGHTER RD	SCHOOL	LAKE HELEN	X	Very High	None	None	96-100	Outside 1.00 Miles
VOLUSIA PINES ELEMENTARY SCHOOL	500 E KICKLIGHTER ROAD	SCHOOL	LAKE HELEN	X	Very High	None	None	96-100	Outside 1.00 Miles
CITY OF LAKE HELEN - WELL 3	551 EAST LEMON AVENUE	UTILITY	LAKE HELEN	A	Very High	None	None	96-100	Outside 1.00 Miles
NEW SMYRNA BEACH MUNICIPAL AIRPORT	210 SAMS AVENUE	AIRPORT	NEW SMYRNA BCH	A	Low	Category 3	Zone C	101-105	Within 1.00 Miles
NEW SMYRNA BEACH CITY HALL	210 SAMS AVE	CITY HALL	NEW SMYRNA BCH	X	Low	Category 3	Zone C	101-105	Within 1.00 Miles
NEW SMYRNA BEACH STATION 50	103 FAULKNER ST	FIRE STATION	NEW SMYRNA BCH	AE	Low	Category 2	Zone B	101-105	Within 1.00 Miles
NEW SMYRNA BEACH STATION 51	151 WILLIAMSON BLVD EXT	FIRE STATION	NEW SMYRNA BCH	A	Low	None	None	101-105	Outside 1.00 Miles
NEW SMYRNA BEACH STATION 52	500 3RD AVE	FIRE STATION	NEW SMYRNA BCH	AE	Low	Category 2	Zone A	101-105	Outside 1.00 Miles
NEW SMYRNA BEACH STATION 53	1400 N DIXIE FREEWAY	FIRE STATION	NEW SMYRNA BCH	A	Low	Category 3	Zone C	101-105	Within 1.00 Miles
NEW SMYRNA BEACH STATION 54	MARY AVENUE	FIRE STATION	NEW SMYRNA BCH	AE	Very High	Category 2	Zone B	101-105	Within 0.50 Miles
PETROLANE GAS SERVICE	411 6 STREET	INDUSTRIAL	NEW SMYRNA BCH	A	Low	None	None	101-105	Outside 1.00 Miles
RINKER MATERIALS CORP - NEW SMYRNA	700 SOUTH DIXIE FWY	INDUSTRIAL	NEW SMYRNA BCH	AE	High	Category 3	Zone C	101-105	Within 0.25 Miles
SPARKLE ICE - NEW SMYRNA BEACH PLANT	1420 INDUSTRIAL DRIVE	INDUSTRIAL	NEW SMYRNA BCH	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
EVAC AMBULANCE STATION 7	534 N DIXIE FREEWAY	MEDICAL	NEW SMYRNA BCH	X	Very High	Category 3	Zone C	101-105	Within 1.00 Miles
COAST GUARD STATION - PONCE INLET	2999 N PENINSULA AVE	POLICE	NEW SMYRNA BCH	X	Low	Category 2	Zone A	101-105	Outside 1.00 Miles
NEW SMYRNA BEACH POLICE DEPT	1400 N DIXIE FRWY	POLICE	NEW SMYRNA BCH	A	Low	Category 3	Zone C	101-105	Within 1.00 Miles
CHISHOLM ELEMENTARY SCHOOL	557 RONNOCK LANE	SCHOOL	NEW SMYRNA BCH	X	Very High	Category 3	Zone B	101-105	Within 0.50 Miles
CORONADO BEACH ELEMENTARY SCHOOL	3500 MICHIGAN AVENUE	SCHOOL	NEW SMYRNA BCH	X	Low	Category 3	Zone A	101-105	Within 0.50 Miles
FUTURE SCHOOL SITE 4	MELETO BOULEVARD	SCHOOL	NEW SMYRNA BCH	A	Low	None	None	101-105	Outside 1.00 Miles
NEW SMYRNA BEACH HIGH SCHOOL	1015 10TH STREET	SCHOOL	NEW SMYRNA BCH	A	Very High	Category 3	Zone C	101-105	Within 1.00 Miles
NEW SMYRNA BEACH MIDDLE SCHOOL	1200 S MYRTLE AVENUE	SCHOOL	NEW SMYRNA BCH	A	Low	Category 3	Zone C	101-105	Within 0.50 Miles
READ-PATILLO ELEMENTARY SCHOOL	400 6TH STREET	SCHOOL	NEW SMYRNA BCH	AE	Very High	Category 3	Zone C	101-105	Within 0.10 Miles
SACRED HEART SCHOOL	1003 TURBULL STREET	SCHOOL	NEW SMYRNA BCH	X	Very High	Category 3	Zone C	101-105	Within 0.25 Miles
NEW SMYRNA BCH TRANSFER STATION	601 N ORCHARD STREET	UTILITY	NEW SMYRNA BCH	AE	Very High	Category 3	Zone C	101-105	Within 1.00 Miles
DALPHONSE RANCH AIRPORT	3533 IRISH LANE	AIRPORT	OAK HILL	A	High	Category 4	Zone D	101-105	Within 0.10 Miles
OAK HILL CITY HALL	234 S US HWY 1	CITY HALL	OAK HILL	X	Very High	Category 4	Zone D	101-105	Within 1.00 Miles
OAK HILL STATION 22	213 N US HWY 1	FIRE STATION	OAK HILL	X	Low	Category 4	Zone D	101-105	Within 0.10 Miles
OAK HILL POLICE DEPT /SO	234 S US HWY 1	POLICE	OAK HILL	X	Very High	Category 4	Zone D	101-105	Within 1.00 Miles
OAK HILL CHRISTIAN ACADEMY	159 N GAINES STREET	SCHOOL	OAK HILL	X	Very High	Category 4	Zone D	101-105	Within 0.50 Miles
OAK HILL ELEMENTARY SCHOOL	RIDGE ROAD	SCHOOL	OAK HILL	A	Very High	None	Zone D	101-105	Within 1.00 Miles
ORANGE CITY CITY HALL	205 E GRAVES AVE	CITY HALL	ORANGE CITY	X	Very High	None	None	96-100	Outside 1.00 Miles
ORANGE CITY STATION 67	215 N HOLLY AV	FIRE STATION	ORANGE CITY	X	Low	None	None	96-100	Outside 1.00 Miles
ORANGE CITY STATION 68	743 HARLEY STRICKLAND BV	FIRE STATION	ORANGE CITY	X	High	None	None	96-100	Outside 1.00 Miles
WEST VOLUSIA INTERCO LOC 2	ENTERPRISE ROAD	INDUSTRIAL	ORANGE CITY	A	Low	None	None	96-100	Outside 1.00 Miles
ORANGE CITY POLICE DEPT	225 N HOLLY AVE	POLICE	ORANGE CITY	X	Low	None	None	96-100	Outside 1.00 Miles
MANATEE COVE ELEMENTARY SCHOOL	734 W OHIO AVENUE	SCHOOL	ORANGE CITY	X	High	None	None	96-100	Outside 1.00 Miles
ORANGE CITY ELEMENTARY SCHOOL	555 E UNIVERSITY AVENUE	SCHOOL	ORANGE CITY	X	Low	None	None	96-100	Outside 1.00 Miles
ORANGE CITY UNIVERSITY HIGH SCHOOL	1000 W RHODE ISLAND AVE	SCHOOL	ORANGE CITY	X	High	None	None	96-100	Outside 1.00 Miles
RIVER SPRINGS MIDDLE SCHOOL	900 W OHIO AVENUE	SCHOOL	ORANGE CITY	X	High	None	None	96-100	Outside 1.00 Miles
STOREFRONT SCHOOL WEST	1000 W RHODE ISLAND AVE	SCHOOL	ORANGE CITY	X	Low	None	None	96-100	Outside 1.00 Miles
ORANGE CITY UTILITIES	426 S VOLUSIA AVENUE	UTILITY	ORANGE CITY	A	Very High	None	None	96-100	Outside 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 5)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
ORMOND BEACH PUBLIC WORKS	501 NORTH ORCHARD ST	ADMIN	ORMOND BEACH	AE	Very High	Category 4	Zone E	101-105	Within 0.50 Miles
ORMOND BEACH MUNICIPAL AIRPORT	770 AIRPORT ROAD	AIRPORT	ORMOND BEACH	A	High	None	None	96-100	Outside 1.00 Miles
ORMOND BEACH CITY HALL	22 S BEACH ST	CITY HALL	ORMOND BEACH	X	Very High	Category 4	Zone E	101-105	Within 0.50 Miles
AVANTE AT ORMOND BEACH	170 NORTH KINGS RD	ELDERLY CARE	ORMOND BEACH	X	Very High	Category 5	Zone E	96-100	Within 1.00 Miles
BRIDGEVIEW CENTER	350 S RIDGEWOOD AVE	ELDERLY CARE	ORMOND BEACH	X	Very High	None	Zone E	101-105	Within 0.50 Miles
CLARE BRIDGE	240 INTERCHANGE BLVD	ELDERLY CARE	ORMOND BEACH	X	High	None	None	96-100	Within 1.00 Miles
GOLDEN ABBEY	1410 HAND AVE	ELDERLY CARE	ORMOND BEACH	A	Low	None	None	96-100	Within 0.25 Miles
GRAND VILLA OF ORMOND	535 NORTH NOVA RD	ELDERLY CARE	ORMOND BEACH	X	Very High	Category 4	Zone E	96-100	Outside 1.00 Miles
ORMOND IN THE PINES	101 CLYDE MORRIS BV	ELDERLY CARE	ORMOND BEACH	X	Very High	None	None	96-100	Within 1.00 Miles
SIGNATURE HEALTHCARE	103 CLYDE MORRIS BV	ELDERLY CARE	ORMOND BEACH	X	Very High	None	None	96-100	Within 1.00 Miles
WELLINGTON PLACE BY THE SEA	1050 OCEAN SHORE BV	ELDERLY CARE	ORMOND BEACH	X	Very High	Category 4	Zone A	101-105	Outside 1.00 Miles
FIRE STATION 93	300 WILMETTE AVE	FIRE STATION	ORMOND BEACH	AE	Low	Category 4	Zone E	101-105	Within 0.50 Miles
HALIFAX STATION 13	15 SOUTHLAND RD	FIRE STATION	ORMOND BEACH	X	High	None	None	96-100	Outside 1.00 Miles
ORMOND BEACH STATION 91	364 S ATLANTIC AV	FIRE STATION	ORMOND BEACH	X	Low	Category 4	Zone A	101-105	Within 0.10 Miles
ORMOND BEACH STATION 92	189 S NOVA RD	FIRE STATION	ORMOND BEACH	X	Very High	None	None	96-100	Within 0.50 Miles
ORMOND BEACH STATION 93	300 WILMETTE AVE	FIRE STATION	ORMOND BEACH	AE	Low	Category 4	Zone E	101-105	Within 0.50 Miles
ORMOND BEACH STATION 94	2301 AIRPORT RD	FIRE STATION	ORMOND BEACH	X	High	None	None	96-100	Outside 1.00 Miles
COQUINA CENTER	170 NORTH CENTER ST	INDUSTRIAL	ORMOND BEACH	AE	Very High	Category 4	Zone E	101-105	Within 1.00 Miles
CROWN CASTLE USA	123 N ORCHARD ST	INDUSTRIAL	ORMOND BEACH	A	Very High	Category 4	Zone E	101-105	Within 0.25 Miles
EVERGREEN	720 SANTA ANA AVE	INDUSTRIAL	ORMOND BEACH	A	Very High	Category 4	Zone E	101-105	Outside 1.00 Miles
FLORIDA PRODUCTION ENGINEERING	2 E TOWER CIR	INDUSTRIAL	ORMOND BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
HAWAIIAN TROPIC (PLAYTEX MFG)	1190 N US HWY 1	INDUSTRIAL	ORMOND BEACH	X	Low	None	Zone E	96-100	Outside 1.00 Miles
HOMAC MANUFACTURING	1 AVIATOR WAY	INDUSTRIAL	ORMOND BEACH	X	High	None	None	96-100	Outside 1.00 Miles
HUDSON TOOL AND DIE	1327 US 1 NORTH	INDUSTRIAL	ORMOND BEACH	A	High	None	None	96-100	Outside 1.00 Miles
KOZY KORNER	605 ORCHARD AVE	INDUSTRIAL	ORMOND BEACH	A	Very High	Category 4	Zone E	101-105	Outside 1.00 Miles
LOWE'S	1340 W GRANADA BV	INDUSTRIAL	ORMOND BEACH	A	High	None	None	96-100	Within 1.00 Miles
PRESTIGE GUNITE	1229 N US HWY 1	INDUSTRIAL	ORMOND BEACH	X	Very High	None	None	96-100	Outside 1.00 Miles
RINKER MATERIALS CORP - ORMOND	350 WEST GRANADA AVE	INDUSTRIAL	ORMOND BEACH	AE	Very High	Category 4	Zone E	101-105	Within 0.50 Miles
RINKER MATERIALS CORPORATION	350 W GRANADA BLVD	INDUSTRIAL	ORMOND BEACH	AE	Low	Category 4	Zone E	101-105	Within 0.25 Miles
SEASONS BY RIVIERA	515 TOMOKA AVE	INDUSTRIAL	ORMOND BEACH	A	Very High	Category 4	Zone E	101-105	Within 0.10 Miles
SOUTHLAND SUITES OF ORMOND	550 WILMETTE AVE	INDUSTRIAL	ORMOND BEACH	AE	Very High	Category 4	Zone E	101-105	Within 1.00 Miles
SUNRISE AVIATION	740 AIRPORT RD	INDUSTRIAL	ORMOND BEACH	X	High	None	None	96-100	Outside 1.00 Miles
ORMOND BEACH MEMORIAL HOSPITAL	305 MEMORIAL MED PwY	MEDICAL	ORMOND BEACH	X	Low	Category 5	Zone A	101-105	Within 0.50 Miles
ORMOND BEACH POLICE DEPT	170 W GRANADA BLVD	POLICE	ORMOND BEACH	X	Low	Category 4	Zone E	101-105	Within 0.50 Miles
BET SEFER HERITAGE SCHOOL	55 N WASHINGTON ST	SCHOOL	ORMOND BEACH	X	Very High	Category 4	Zone E	101-105	Within 0.25 Miles
CALVARY CHRISTIAN ACADEMY	1687 W GRENADA BLVD	SCHOOL	ORMOND BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
GRACE ACADEMY	1060 W GRENADA BLVD	SCHOOL	ORMOND BEACH	X	Very High	None	None	96-100	Within 1.00 Miles
ORMOND BEACH ELEMENTARY SCHOOL	100 CORBIN AVENUE	SCHOOL	ORMOND BEACH	X	Very High	Category 5	Zone E	101-105	Within 0.50 Miles
ORMOND BEACH MIDDLE SCHOOL	151 DOMICILIO AVENUE	SCHOOL	ORMOND BEACH	A	Very High	Category 4	Zone E	101-105	Outside 1.00 Miles
OSCEOLA ELEMENTARY SCHOOL	100 OSCEOLA AVENUE	SCHOOL	ORMOND BEACH	X	Low	Category 4	Zone A	101-105	Within 0.10 Miles
PACE CENTER FOR GIRLS	208 CENTRAL AVENUE	SCHOOL	ORMOND BEACH	X	Very High	Category 4	Zone E	101-105	Within 1.00 Miles
PATHWAYS ELEMENTARY SCHOOL	2100 AIRPORT ROAD	SCHOOL	ORMOND BEACH	X	High	None	None	96-100	Outside 1.00 Miles
PINE TRAIL ELEMENTARY SCHOOL	300 AIRPORT ROAD	SCHOOL	ORMOND BEACH	A	High	None	None	96-100	Outside 1.00 Miles
RIVERBEND ACADEMY	2080 W GRENADA BLVD	SCHOOL	ORMOND BEACH	X	Low	None	None	96-100	Outside 1.00 Miles
ST BRENDAN SCHOOL	1000 OCEAN SHORE BV	SCHOOL	ORMOND BEACH	X	Very High	Category 4	Zone A	101-105	Outside 1.00 Miles
ST JAMES EPISCOPAL SCHOOL	38 S HALIFAX DRIVE	SCHOOL	ORMOND BEACH	X	Very High	Category 4	Zone A	101-105	Within 0.25 Miles
TEMPLE BETH ELEMENTARY SCHOOL	579 N NOVA ROAD	SCHOOL	ORMOND BEACH	X	High	Category 4	Zone E	96-100	Outside 1.00 Miles
TOMOKA ELEMENTARY SCHOOL	999 OLD TOMOKA ROAD	SCHOOL	ORMOND BEACH	X	Very High	None	None	96-100	Within 1.00 Miles
TYMBER CREEK UTILITIES	1951 W GRENADA BLVD	UTILITY	ORMOND BEACH	A	Very High	None	None	96-100	Outside 1.00 Miles
PIERSON MUNICIPAL AIRPORT	106 N CENTER STREET	AIRPORT	PIERSON	X	Low	None	None	96-100	Outside 1.00 Miles
PIERSON CITY HALL	106 N CENTER ST	CITY HALL	PIERSON	X	Very High	None	None	96-100	Within 1.00 Miles
PIERSON STATION 44	132 N FOUNTAIN DR	FIRE STATION	PIERSON	X	Very High	None	None	96-100	Within 1.00 Miles
PIERSON ELEMENTARY REPLACEMENT	N CENTER STREET (US 17)	SCHOOL	PIERSON	X	Low	None	None	96-100	Outside 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 6)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
PIERSON ELEMENTARY SCHOOL	1 W 1ST AVENUE	SCHOOL	PIERSON	X	Very High	None	None	96-100	Outside 1.00 Miles
TAYLOR MIDDLE-HIGH SCHOOL	100 E WASHINGTON AVE	SCHOOL	PIERSON	X	Low	None	None	96-100	Outside 1.00 Miles
PONCE INLET CITY HALL	4300 S ATLANTIC DR	CITY HALL	PONCE INLET	X	Low	Category 5	Zone A	101-105	Outside 1.00 Miles
PONCE INLET STATION 78	4680 S PENINSULA DR	FIRE STATION	PONCE INLET	A	High	Category 2	Zone A	101-105	Outside 1.00 Miles
PONCE INLET POLICE DEPT	4301 S PENINSULA DR	POLICE	PONCE INLET	A	Low	Category 3	Zone A	101-105	Outside 1.00 Miles
PORT ORANGE PUBLIC WORKS	407 VIRGINIA AV	ADMIN	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
PORT ORANGE CITY HALL	1000 CITY CENTER CIR	CITY HALL	PORT ORANGE	X	Very High	None	None	101-105	Within 1.00 Miles
ADULT ACTIVITY CENTER	4790 RIDGEWOOD AV	ELDERLY CARE	PORT ORANGE	A	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
BAYSIDE CARE CENTER	3778 MAPLE GROVE CT.	ELDERLY CARE	PORT ORANGE	A	Very High	None	None	101-105	Within 1.00 Miles
CANAL VIEW REST HOME	864 CANALVIEW BLVD.	ELDERLY CARE	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
COUNTRY MANOR REST HOME	1152 OLD HAMMOCK RD.	ELDERLY CARE	PORT ORANGE	X	Very High	Category 5	Zone E	101-105	Within 0.50 Miles
COUNTRYSIDE CARE CENTER	710 PINE FOREST TRL.	ELDERLY CARE	PORT ORANGE	X	Very High	Category 4	Zone E	101-105	Outside 1.00 Miles
EDWARDS ADULT FAMILY CARE	5862 HENSEL RD.	ELDERLY CARE	PORT ORANGE	X	Very High	None	None	101-105	Outside 1.00 Miles
FRAN'S ELDERLY CARE	1309 ALCORN RD.	ELDERLY CARE	PORT ORANGE	A	Very High	None	None	101-105	Outside 1.00 Miles
HARBOR OAKS ELDERLY CARE	158 FARMBROOK AVE.	ELDERLY CARE	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
MANILA HOME CARE	5463 LANDIS AVE.	ELDERLY CARE	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
OPEN ARMS CARE CENTER	401 ORANGE AVE.	ELDERLY CARE	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
SENIOR CENTER	3738 HALIFAX DR	ELDERLY CARE	PORT ORANGE	AE	Low	Category 3	Zone B	101-105	Outside 1.00 Miles
SUNRISE OAKS ASSISTED LIVING	3739 SUNRISE OAKS DR.	ELDERLY CARE	PORT ORANGE	A	High	None	None	101-105	Within 1.00 Miles
TWIN ACRES REST HOME	1155 BUTTERMILK LN.	ELDERLY CARE	PORT ORANGE	X	Very High	None	None	101-105	Within 1.00 Miles
FIRE STATION 71	4200 S RIDGEWOOD AVE	FIRE STATION	PORT ORANGE	AE	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
FIRE STATION 74	6701 AIRPORT RD	FIRE STATION	PORT ORANGE	X	Low	Category 5	Zone E	101-105	Outside 1.00 Miles
PORT ORANGE STATION 71	4200 RIDGEWOOD AVE	FIRE STATION	PORT ORANGE	AE	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
PORT ORANGE STATION 72	6027 CENTRAL PARK BLVD	FIRE STATION	PORT ORANGE	A	Very High	Category 3	Zone C	101-105	Outside 1.00 Miles
PORT ORANGE STATION 73	1090 CITY CENTER BLVD	FIRE STATION	PORT ORANGE	X	Low	None	None	101-105	Within 1.00 Miles
PORT ORANGE STATION 74	6701 AIRPORT RD	FIRE STATION	PORT ORANGE	A	High	None	Zone E	101-105	Outside 1.00 Miles
PORT ORANGE STATION 75	1701 TOWN WEST BLVD	FIRE STATION	PORT ORANGE	X	High	None	None	101-105	Outside 1.00 Miles
GOLF CLUB AT CYPRESS HEAD	6251 PALM VISTA ST	INDUSTRIAL	PORT ORANGE	X	High	None	None	101-105	Outside 1.00 Miles
QUINLEY INN, INC.	861 SUGAR HOUSE DR.	INDUSTRIAL	PORT ORANGE	A	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
RAYDON	1420 HOCKNEY CT.	INDUSTRIAL	PORT ORANGE	A	Low	None	None	101-105	Outside 1.00 Miles
RIVERVIEW ALF	4714 HALIFAX DR.	INDUSTRIAL	PORT ORANGE	AE	Low	Category 3	Zone B	101-105	Outside 1.00 Miles
SPRUCE CREEK ROAD PARK	5959 SPRUCE CREEK RD	INDUSTRIAL	PORT ORANGE	AE	Very High	Category 3	Zone B	101-105	Outside 1.00 Miles
THE ARMORY OF DAYTONA BEACH	707 SAMMS AVE	INDUSTRIAL	PORT ORANGE	A	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
US FOODS	5424 S WILLIAMSON BLVD	INDUSTRIAL	PORT ORANGE	AE	Low	None	None	101-105	Outside 1.00 Miles
PORTSIDE CARE CENTER	3832 LONG GROVE LANE	MEDICAL	PORT ORANGE	A	Very High	None	None	101-105	Within 1.00 Miles
PORT ORANGE POLICE DEPT	4545 CLYDE MORRIS	POLICE	PORT ORANGE	X	Very High	None	None	101-105	Within 0.50 Miles
PORT ORANGE REG COMM CTR	1395 DUNLAWTON AVE	POLICE	PORT ORANGE	X	Very High	None	None	101-105	Outside 1.00 Miles
ACADEMY OF MARTIAL ARTS, INC	220 CHARLES ST	SCHOOL	PORT ORANGE	AE	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
ATLANTIC HIGH SCHOOL	1250 REED CANAL ROAD	SCHOOL	PORT ORANGE	X	Very High	None	None	101-105	Within 0.25 Miles
COMMONWEALTH CHRISTIAN ACADEMY	5231 S NOVA ROAD	SCHOOL	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
COMMUNITY LEARNING CENTER EAST	1290 HERBERT STREET	SCHOOL	PORT ORANGE	X	Very High	None	None	101-105	Within 0.50 Miles
CREEKSIDE MIDDLE SCHOOL	6801 AIRPORT ROAD	SCHOOL	PORT ORANGE	A	Low	None	Zone E	101-105	Outside 1.00 Miles
CYPRESS CREEK ELEMENTARY SCHOOL	6100 S WILLIAMSON BLVD	SCHOOL	PORT ORANGE	X	High	Category 4	Zone E	101-105	Outside 1.00 Miles
HORIZON ELEMENTARY SCHOOL	4751 HIDDEN LAKE DR	SCHOOL	PORT ORANGE	A	Very High	None	None	101-105	Outside 1.00 Miles
MONTESSORI SCHOOL OF PORT ORANGE	3749 S NOVA ROAD	SCHOOL	PORT ORANGE	A	Low	Category 3	Zone C	101-105	Within 1.00 Miles
PORT ORANGE ELEMENTARY SCHOOL	402 DUNLAWTON AVENUE	SCHOOL	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
SILVER SANDS MIDDLE SCHOOL	1300 HERBERT STREET	SCHOOL	PORT ORANGE	X	Very High	None	None	101-105	Within 1.00 Miles
SPRUCE CREEK ELEMENTARY SCHOOL	642 TAYLOR ROAD	SCHOOL	PORT ORANGE	A	Very High	Category 5	Zone E	101-105	Outside 1.00 Miles
SPRUCE CREEK HIGH SCHOOL	801 TAYLOR ROAD	SCHOOL	PORT ORANGE	A	Very High	None	None	101-105	Outside 1.00 Miles
SUGAR MILL ELEMENTARY SCHOOL	1101 CHARLES STREET	SCHOOL	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
SWEETWATER ELEMENTARY SCHOOL	5800 VICTORIA GARDENS BV	SCHOOL	PORT ORANGE	X	Very High	None	None	101-105	Outside 1.00 Miles
FOC-PORT ORANGE PUBLIC WORKS	407 VIRGINIA AVE	UTILITY	PORT ORANGE	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
WATER TOWER	6260 WILLIAMSON BLVD	UTILITY	PORT ORANGE	X	High	None	None	101-105	Outside 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 7)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
SOUTH DAYTONA CITY HALL	1672 S RIDGEWOOD AVE	CITY HALL	SOUTH DAYTONA	X	Low	Category 4	Zone E	101-105	Within 0.10 Miles
SOUTH DAYTONA STATION 98	1672 S RIDGEWOOD AVE	FIRE STATION	SOUTH DAYTONA	X	Low	Category 4	Zone E	101-105	Within 0.10 Miles
RINKER MATERIALS CORP - DAYTONA	2900 S RIDGEWOOD AVE	INDUSTRIAL	SOUTH DAYTONA	AE	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
SOUTH DAYTONA POLICE DEPT	1672 S RIDGEWOOD AV	POLICE	SOUTH DAYTONA	X	Low	Category 4	Zone E	101-105	Within 0.10 Miles
INTL ACADEMY OF HAIR DESIGN	2550 S RIDGEWOOD AVE	SCHOOL	SOUTH DAYTONA	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
RICHARD MILBURN ACADEMY EAST	1025 MASON AVENUE	SCHOOL	SOUTH DAYTONA	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
SOUTH DAYTONA ELEMENTARY SCHOOL	600 ELIZABETH PLACE	SCHOOL	SOUTH DAYTONA	A	Low	Category 3	Zone C	101-105	Within 1.00 Miles
WARNER CHRISTIAN ACADEMY SCHOOL	1730 S RIDGEWOOD AVE	SCHOOL	SOUTH DAYTONA	X	Low	Category 4	Zone E	101-105	Within 0.25 Miles
AT&T - CELLULAR ONE PORT ORANGE	1133 3 STREET	UTILITY	SOUTH DAYTONA	X	Low	Category 3	Zone C	101-105	Outside 1.00 Miles
BLUE RIDGE FLIGHTPARK	2164 MAYTOWN ROAD	AIRPORT	VOLUSIA (UNINC)	X	Low	None	Zone E	101-105	Within 0.50 Miles
BOB LEE FLIGHT STRIP	5000 BOB LEE ARPT RD	AIRPORT	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
DAN RICE AIRFIELD	82 N ST ANDREWS	AIRPORT	VOLUSIA (UNINC)	A	Low	None	None	96-100	Outside 1.00 Miles
LEFFLER AIRPORT	LEFFLER LANDING ROAD	AIRPORT	VOLUSIA (UNINC)	A	Low	None	None	96-100	Outside 1.00 Miles
SPRUCE CREEK AIRPORT	100 CESSNA BLVD, STE A	AIRPORT	VOLUSIA (UNINC)	X	Low	Category 5	Zone E	101-105	Outside 1.00 Miles
KOVE ESTATES FACILITY	123 KOVE BLVD (OSTEEN)	ELDERLY CARE	VOLUSIA (UNINC)	A	High	None	None	96-100	Outside 1.00 Miles
VOLUSIA COUNTY EOC	3825 TIGER BAY RD	EOC	VOLUSIA (UNINC)	X	Low	None	None	101-105	Outside 1.00 Miles
ASHBY FIRE TOWER	1695 PELL RD	FIRE STATION	VOLUSIA (UNINC)	X	Low	None	None	96-100	Within 0.50 Miles
DELEON FIRE TOWER	5470 N US HWY 17	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
DELEON SPRINGS STATION 41	5007 CENTRAL AV	FIRE STATION	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
FIRE TRAINING CENTER 15	3889 TIGER BAY RD	FIRE STATION	VOLUSIA (UNINC)	X	Low	None	None	101-105	Outside 1.00 Miles
GLENWOOD STATION 46	920 GLENWOOD RD	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
HALIFAX PLANTATION STATION 16	3935 OLD DIXIE HWY	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
HALIFAX STATION 11	1580 DERBYSHIRE RD	FIRE STATION	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
INDIAN MOUND STATION 34	1700 ENTERPRISE OSTEEN RD	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
KEPLER RIDGE STATION 42	1885 N KEPLER RD	FIRE STATION	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Within 1.00 Miles
LAKE HARNEY STATION 37	740 LK HARNEY WOODS BV	FIRE STATION	VOLUSIA (UNINC)	X	Low	None	None	101-105	Outside 1.00 Miles
NORTH PENINSULA STATION 14	1716 ATLANTIC AVE	FIRE STATION	VOLUSIA (UNINC)	X	Very High	Category 5	Zone A	101-105	Outside 1.00 Miles
OSTEEN STATION 36	180 N SR 415	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
RIMA RIDGE STATION 18	500 RODEO RD	FIRE STATION	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
SEVILLE FIRE TOWER	2015 N US HWY 17	FIRE STATION	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
SOUTH BEACH STATION 21	4840 S ATLANTIC AV	FIRE STATION	VOLUSIA (UNINC)	X	High	Category 2	Zone A	101-105	Outside 1.00 Miles
SPRING LAKES STATION 32	2850 FIREHOUSE RD	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
SPRUCE CREEK STATION 12	1979 TAYLOR RD	FIRE STATION	VOLUSIA (UNINC)	A	High	Category 4	Zone E	101-105	Outside 1.00 Miles
ST JOHNS STATION 45	2580 W NEW YORK AV	FIRE STATION	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
TMOKA FIRE TOWER	3600 OLD DELAND RD	FIRE STATION	VOLUSIA (UNINC)	X	High	None	None	101-105	Outside 1.00 Miles
TURNBULL STATION 23	1850 PIONEER TR	FIRE STATION	VOLUSIA (UNINC)	A	Very High	Category 2	Zone B	101-105	Within 0.50 Miles
AIR GAS SOUTH	874 S NOVA RD	INDUSTRIAL	VOLUSIA (UNINC)	X	Very High	None	None	101-105	Within 1.00 Miles
ARDMORE FARMS	1915 N WOODLAND BLVD	INDUSTRIAL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
BOSTON WHALER	4121 US 1 SOUTH	INDUSTRIAL	VOLUSIA (UNINC)	A	High	Category 3	Zone C	101-105	Outside 1.00 Miles
CROSS CREEK FARMS	82 N ST ANDREWS	INDUSTRIAL	VOLUSIA (UNINC)	A	Low	None	None	96-100	Outside 1.00 Miles
HALIFAX PAVING	860 HULL RD	INDUSTRIAL	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
LAFAYETTE LANDINGS	5201 STATE RD 11	INDUSTRIAL	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
MICROFLEX INC	1800 N US HWY 1	INDUSTRIAL	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
SPARTON ELECTRONICS FLORIDA	5612 JOHNSTON LAKE RD	INDUSTRIAL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
SQUARE D	1601 TIONIA ROAD	INDUSTRIAL	VOLUSIA (UNINC)	AE	Low	Category 1	Zone A	101-105	Outside 1.00 Miles
SUNBELT RENTALS	720 S NOVA RD	INDUSTRIAL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Within 1.00 Miles
TG LEE FOODS	1675 STATE ROAD 472	INDUSTRIAL	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
US FOOD SERVICE	1899 N US HWY 1	INDUSTRIAL	VOLUSIA (UNINC)	A	Low	None	None	96-100	Outside 1.00 Miles
EVAC AMBULANCE STATION 10	2850 FIREHOUSE RD	MEDICAL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
EVAC WEST SIDE HUB - OLD STATION 31	1970 S VOLUSIA AVE	MEDICAL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
CORRECTIONAL FACILITY	1354 N INDIAN LAKE RD	POLICE	VOLUSIA (UNINC)	X	Low	None	None	101-105	Outside 1.00 Miles
JUVENILE DETENTION FACILITY	3840 OLD DELAND RD	POLICE	VOLUSIA (UNINC)	X	Low	None	None	101-105	Outside 1.00 Miles
SHERIFF COMMUNICATIONS DISPATCH	59 KEYTON DR	POLICE	VOLUSIA (UNINC)	X	Low	None	None	101-105	Outside 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Critical Facilities (Page 8)

Name of Facility	Address	Facility Type	Jurisdiction	Flood Zn.	Fire Risk	Surge Zn.	Evac Z.	Wind Risk	Tornado ('60-'14)
DELAND SDA CHURCH SCHOOL	220 N KEPLER ROAD	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Within 1.00 Miles
ELEMENTARY SCHOOL D	FERRIS STREET	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
ENTERPRISE ELEMENTARY SCHOOL	211 MAIN STREET	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
FOREST LAKE ELEMENTARY SCHOOL	1600 DOYLE ROAD	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
FUTURE SCHOOL SITE 1	W INDIAN RIVER BLVD	SCHOOL	VOLUSIA (UNINC)	X	High	Category 3	Zone C	101-105	Outside 1.00 Miles
FUTURE SCHOOL SITE 5	MONAGHAN DRIVE	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
FUTURE SCHOOL SITE 7	CORACI BOULEVARD	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	101-105	Outside 1.00 Miles
FUTURE SCHOOL SITE 8	W MCKENZIE ROAD	SCHOOL	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles
GENEVA ACADEMY	811 ORANGE CAMP ROAD	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
GEORGE MARKS ELEMENTARY SCHOOL	1000 N GARFIELD AVE	SCHOOL	VOLUSIA (UNINC)	X	Low	None	None	96-100	Within 0.50 Miles
GLENCOE CLASSICAL ACADEMY	196 GLENCOE ROAD	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	Zone E	101-105	Within 1.00 Miles
LIGHTHOUSE CHRISTIAN ACADEMY	126 RIDGEWOOD DRIVE	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
LIGHTHOUSE CHRISTIAN ACADEMY	126 RIDGEWOOD DRIVE	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
LIGHTHOUSE CHRISTIAN ACADEMY	126 RIDGEWOOD DRIVE	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Within 0.50 Miles
MCINNIS ELEMENTARY SCHOOL	5175 US 17	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
OSTEEN ELEMENTARY SCHOOL	500 DOYLE ROAD	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
ROCK CHURCH ACADEMY	1818 TAYLOR ROAD	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	101-105	Outside 1.00 Miles
SAMSULA ACADEMY	248 N SAMSULA DRIVE	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	101-105	Outside 1.00 Miles
SEVILLE ELEMENTARY SCHOOL	N US 17	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
SOUTHWESTERN MIDDLE SCHOOL	605 W NEW HAMPSHIRE AVE	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Within 0.50 Miles
STETSON UNIVERSITY	421 N WOODLAND BLVD	SCHOOL	VOLUSIA (UNINC)	AE	High	None	None	96-100	Outside 1.00 Miles
STOREFRONT EAST	S CLYDE MORRIS BLVD	SCHOOL	VOLUSIA (UNINC)	X	Low	None	None	101-105	Within 0.10 Miles
VICTORY CHRISTIAN ACADEMY	209 ADAMS ROAD	SCHOOL	VOLUSIA (UNINC)	X	High	Category 4	Zone D	101-105	Outside 1.00 Miles
WALTER HURST ELEMENTARY SCHOOL	1340 WRIGHT STREET	SCHOOL	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
WOODWARD AVE ELEMENTARY SCHOOL	1201 S WOODWARD AVE	SCHOOL	VOLUSIA (UNINC)	X	High	None	None	96-100	Within 0.25 Miles
AT&T - CELLULAR ONE BARBERVILLE	1869 S COUNTY ROAD 3	UTILITY	VOLUSIA (UNINC)	X	High	None	None	96-100	Outside 1.00 Miles
AT&T - CELLULAR ONE EDGEWATER	3188 W INDIAN RIVER BLVD	UTILITY	VOLUSIA (UNINC)	X	Low	Category 4	Zone E	101-105	Outside 1.00 Miles
FLORIDA POWER - TURNER POWER PLANT	201 DEBARY AVENUE	UTILITY	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Outside 1.00 Miles
FLORIDA PUBLIC UTILITIES	401 NORTH STONE STREET	UTILITY	VOLUSIA (UNINC)	X	Very High	None	None	96-100	Within 1.00 Miles
NORTH PENINSULA UTILITIES	14 SEABRIDGE DRIVE	UTILITY	VOLUSIA (UNINC)	X	Very High	Category 4	Zone A	101-105	Outside 1.00 Miles
SOLID WASTE TRANSFER STATION	3151 E SR 44	UTILITY	VOLUSIA (UNINC)	X	Low	None	None	96-100	Within 1.00 Miles
WASTE MANAGEMENT	1325 HULL TRL	UTILITY	VOLUSIA (UNINC)	X	Low	None	None	96-100	Outside 1.00 Miles

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### **Water and Sewage Treatment Facilities**

The following pages list the water and sewage treatment facilities located in Volusia County, along with their respective hazard zones.

Facility Name	Latitude	Longitude	Type	Flood Zone	Fire Zone	Storm Surge Zone	Wind Zone
FLO025984	29.195	81.001	Sewage Treatment	Zone AE	No Risk	Category 1	101-105 mph
FLA011177	28.924	80.872	Sewage Treatment	X - 500 yr	High Risk	Category 4	101-105 mph
FLO020532	29.288	81.073	Sewage Treatment	Zone AE	High Risk	Category 4	101-105 mph
FLA011128	28.908	81.325	Sewage Treatment	X - 500 yr	High Risk	None	96-100 mph
FLA011118	28.929	81.286	Sewage Treatment	X - 500 yr	High Risk	None	96-100 mph
FLA011179	29.25	81.117	Sewage Treatment	X - 500 yr	Low Risk	None	96-100 mph
FLO020559	29.136	80.994	Sewage Treatment	X - 500 yr	Low Risk	Category 3	101-105 mph
FLO020133	29.03	80.917	Sewage Treatment	Zone AE	Low Risk	Category 2	101-105 mph
FLO027677	29.24	81.044	Sewage Treatment	Zone AE	Low Risk	Category 4	101-105 mph
FLA011139	29.175	81.111	Sewage Treatment	X - 500 yr	Low Risk	None	101-105 mph
FLA011109	29.083	81.043	Sewage Treatment	X - 500 yr	Very High Risk	Category 4	101-105 mph
FLO024546	28.874	81.251	Sewage Treatment	X - 500 yr	Very High Risk	None	96-100 mph
FLA011193	29.265	81.127	Sewage Treatment	X - 500 yr	Very High Risk	None	96-100 mph
FLA011188	29.383	81.083	Sewage Treatment	X - 500 yr	Very High Risk	Category 5	101-105 mph
FLO021431	28.973	80.915	Sewage Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
FLA011132	29.083	81.325	Sewage Treatment	X - 500 yr	Very High Risk	None	96-100 mph
FLO020303	29.009	81.298	Sewage Treatment	X - 500 yr	Very High Risk	None	96-100 mph
FLA011121	28.916	81.25	Sewage Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.922	81.19	Water Treatment	Zone AE	No Risk	None	96-100 mph
SEM. CO/HEATHROW SYS	28.786	81.012	Water Treatment	Zone AE	No Risk	None	101-105 mph
SEM. CO/HEATHROW SYS	28.786	81.012	Water Treatment	Zone AE	No Risk	None	101-105 mph
MCINNIS ELEMENTARY	29.127	81.352	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
LAKE BERESFORD	29.01	81.345	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.897	81.311	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.897	81.311	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.903	81.29	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.903	81.29	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.953	81.272	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.957	81.269	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.957	81.269	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.929	81.254	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.933	81.25	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.933	81.25	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
DELTONA NORTH	28.941	81.244	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
DELTONA NORTH	28.941	81.244	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.939	81.224	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
LAKE HELEN WATER DEP	28.984	81.222	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.941	81.18	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.941	81.18	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
KOVE ESTATES ASSOCIA	28.845	81.173	Water Treatment	Zone A	High Risk	None	96-100 mph
TOMOKA VIEW ESTATES	29.263	81.129	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
TOMOKA VIEW ESTATES	29.263	81.129	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
SCOTTISH INN	29.333	81.127	Water Treatment	X - 500 yr	High Risk	None	96-100 mph
SUGAR MILL COUNTRY C	29.04	80.978	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
SUGAR MILL COUNTRY C	29.04	80.978	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
SUGAR MILL COUNTRY C	29.04	80.978	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
SUGAR MILL COUNTRY C	29.04	80.978	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
NEW SMYRNA BEACH, CI	28.994	80.962	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
NEW SMYRNA BEACH, CI	28.994	80.962	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
NEW SMYRNA BEACH, CI	28.994	80.962	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
NEW SMYRNA BEACH, CI	28.994	80.962	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
NEW SMYRNA BEACH, CI	28.994	80.962	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph
NEW SMYRNA BEACH, CI	28.994	80.962	Water Treatment	X - 500 yr	High Risk	Category 5	101-105 mph

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

Water and Sewage Treatment Facilities, Page 2

Facility Name	Latitude	Longitude	Type	Flood Zone	Fire Zone	Storm Surge Zone	Wind Zone
HACIENDA DEL RIO	28.925	80.886	Water Treatment	X - 500 yr	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.925	80.886	Water Treatment	X - 500 yr	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.925	80.886	Water Treatment	X - 500 yr	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.927	80.88	Water Treatment	Zone A	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.927	80.88	Water Treatment	Zone A	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.926	80.876	Water Treatment	Zone A	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.926	80.876	Water Treatment	Zone A	High Risk	Category 4	101-105 mph
HACIENDA DEL RIO	28.926	80.876	Water Treatment	Zone A	High Risk	Category 4	101-105 mph
SOUTH WATER FRONT PA	28.908	80.87	Water Treatment	X - 500 yr	High Risk	Category 3	101-105 mph
SOUTH WATER FRONT PA	28.908	80.87	Water Treatment	X - 500 yr	High Risk	Category 3	101-105 mph
SOUTH WATER FRONT PA	28.908	80.87	Water Treatment	X - 500 yr	High Risk	Category 3	101-105 mph
SOUTH WATER FRONT PA	28.908	80.87	Water Treatment	X - 500 yr	High Risk	Category 3	101-105 mph
SOUTH WATER FRONT PA	28.908	80.87	Water Treatment	X - 500 yr	High Risk	Category 3	101-105 mph
CAMP WINONA	29.179	81.341	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
BLUE SPRINGS STATE P	28.952	81.335	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
DELAND, CITY OF	29.032	81.324	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
DELAND, CITY OF	29.038	81.319	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
DELAND/BRANDYWINE	29.075	81.315	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
DELAND, CITY OF	29.031	81.309	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
DELAND, CITY OF	29.021	81.299	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
DELAND, CITY OF	29.02	81.299	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.915	81.296	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
SHERWOOD MEDICAL IND	29.06	81.265	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
SHERWOOD MEDICAL IND	29.06	81.265	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
LAKE HELEN WATER DEP	28.995	81.245	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
QUALITY INN (SAVE IN	29.019	81.238	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.896	81.236	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.896	81.236	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.896	81.236	Water Treatment	X - 500 yr	Low Risk	None	96-100 mph
HANDY WAY #3321/SPAR	29.133	81.2	Water Treatment	Zone A	Low Risk	None	96-100 mph
HANDY WAY #3319/OCAL	29.133	81.2	Water Treatment	Zone A	Low Risk	None	96-100 mph
A&M DISCOUNT BEVERAG	29.133	81.2	Water Treatment	Zone A	Low Risk	None	96-100 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
DAYTONA BEACH, CITY	29.172	81.116	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
COLUMBIA ELEMENTARY	28.86	81.103	Water Treatment	Zone A	Low Risk	None	96-100 mph
DAYTONA BEACH, CITY	29.189	81.074	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
HOLLY HILL, CITY OF	29.24	81.044	Water Treatment	Zone AE	Low Risk	Category 4	101-105 mph
HOLLY HILL, CITY OF	29.24	81.044	Water Treatment	Zone AE	Low Risk	Category 4	101-105 mph
HOLLY HILL, CITY OF	29.24	81.044	Water Treatment	Zone AE	Low Risk	Category 4	101-105 mph
HOLLY HILL, CITY OF	29.24	81.044	Water Treatment	Zone AE	Low Risk	Category 4	101-105 mph
SOUTH DAYTONA, CITY O	29.199	81.043	Water Treatment	X - 500 yr	Low Risk	Category 4	101-105 mph
SPRUCE CREEK REST AR	29.088	81.018	Water Treatment	X - 500 yr	Low Risk	Category 3	101-105 mph
EDGEWATER, CITY OF	28.964	80.96	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
EDGEWATER, CITY OF	28.964	80.96	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
EDGEWATER, CITY OF	28.964	80.96	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph
EDGEWATER, CITY OF	28.964	80.96	Water Treatment	X - 500 yr	Low Risk	None	101-105 mph

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

Water and Sewage Treatment Facilities, Page 3

Facility Name	Latitude	Longitude	Type	Flood Zone	Fire Zone	Storm Surge Zone	Wind Zone
TOWN OF PIERSON/OP.B	29.241	81.465	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
MEADOWLEA ON THE RIV	28.839	81.333	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
MEADOWLEA ON THE RIV	28.839	81.333	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
DELAND/HOLIDAY HILLS	29	81.319	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
DELAND/WOODLAND MANO	29.091	81.315	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.952	81.308	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.952	81.308	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.952	81.308	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.911	81.307	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.913	81.305	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
DELAND, CITY OF	29.027	81.305	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
WEST VOLUSIA INTERCO	28.883	81.3	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
DELAND, CITY OF	29.035	81.29	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
JOHN KNOX VILLAGE	28.942	81.283	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
ORANGE CITY UTILITIE	28.94	81.274	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.9	81.27	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.9	81.27	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.902	81.258	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.902	81.258	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.905	81.256	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.923	81.243	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.883	81.233	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.883	81.233	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.883	81.233	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.883	81.233	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
LAKE HELEN WATER DEP	28.979	81.229	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.882	81.203	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
SOUTHERN STATES UTIL	28.882	81.203	Water Treatment	X - 500 yr	Very High Risk	None	96-100 mph
TYMBER CREEK UTILITI	29.265	81.126	Water Treatment	X - 500 yr	Very High Risk	Category 5	96-100 mph
TYMBER CREEK UTILITI	29.265	81.126	Water Treatment	X - 500 yr	Very High Risk	Category 5	96-100 mph
TYMBER CREEK UTILITI	29.264	81.126	Water Treatment	Zone AE	Very High Risk	Category 4	96-100 mph
TYMBER CREEK UTILITI	29.264	81.126	Water Treatment	Zone AE	Very High Risk	Category 4	96-100 mph
ORMOND BEACH, CITY O	29.278	81.061	Water Treatment	X - 500 yr	Very High Risk	Category 4	101-105 mph
ORMOND BEACH, CITY O	29.278	81.061	Water Treatment	X - 500 yr	Very High Risk	Category 4	101-105 mph
ORMOND BEACH, CITY O	29.278	81.061	Water Treatment	X - 500 yr	Very High Risk	Category 4	101-105 mph
ORMOND BEACH, CITY O	29.278	81.061	Water Treatment	X - 500 yr	Very High Risk	Category 4	101-105 mph
ORMOND BEACH, CITY O	29.278	81.061	Water Treatment	X - 500 yr	Very High Risk	Category 4	101-105 mph
SPRUCE CREEK FLY IN	29.081	81.045	Water Treatment	X - 500 yr	Very High Risk	Category 5	101-105 mph
SPRUCE CREEK FLY IN	29.081	81.045	Water Treatment	X - 500 yr	Very High Risk	Category 5	101-105 mph
COLONY IN THE WOODS	29.141	81.028	Water Treatment	X - 500 yr	Very High Risk	None	101-105 mph
PORT ORANGE, CITY OF	29.136	81.027	Water Treatment	X - 500 yr	Very High Risk	None	101-105 mph
PORT ORANGE, CITY OF	29.136	81.027	Water Treatment	X - 500 yr	Very High Risk	None	101-105 mph
PORT ORANGE, CITY OF	29.136	81.027	Water Treatment	X - 500 yr	Very High Risk	None	101-105 mph
PORT ORANGE, CITY OF	29.136	81.027	Water Treatment	X - 500 yr	Very High Risk	None	101-105 mph
TERRA MAR VILLAGE	28.911	80.865	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
TERRA MAR VILLAGE	28.911	80.865	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
TERRA MAR VILLAGE	28.911	80.865	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
TERRA MAR VILLAGE	28.911	80.865	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
TERRA MAR VILLAGE	28.911	80.865	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
INDIAN HARBOR EST.	28.901	80.861	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph
INDIAN HARBOR EST.	28.901	80.861	Water Treatment	X - 500 yr	Very High Risk	Category 3	101-105 mph

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### State Facilities Within Flood Zones

The following table lists the state facilities located within the VE and A flood zones within Volusia County, Florida.

Facility Name	Facility Type	Address	City	Floodzone
Ashby Forestry Site- Fire Tower - D12	Agricultural	1695 PELL ROAD	Osteen	A
Academic Hall	Agricultural	3000 Palm Coast Parkway Southeast	Palm Coast	AE
Classroom Reloc.	Agricultural	3000 Palm Coast Parkway Southeast	Palm Coast	AE
Laboratory Reloc.	Agricultural	940 Tenth Street	New Smyrna Beach	AE
Student Services Center	Agricultural	940 Tenth Street	New Smyrna Beach	AE
Bathhouse - DeLeon Springs SP	Other	601 PONCE DELEON BLVD	De Leon Springs	AE
Cabin - Hontoon Island SP	Other	2309 RIVER RIDGE ROAD	Deland	AE
Concession-Office Hontoon Island SP	Other	Not Listed	Deland	AE
Concession-Visitor Center Meeting Rooms	Other	601 PONCE DELEON BLVD	De Leon Springs	AE
Old Spanish Sugar Mill	Other	601 PONCE DELEON BLVD	De Leon Springs	AE
Restroom Hontoon Island SP	Other	2309 RIVER RIDGE ROAD	Deland	AE
Restroom Hontoon Island SP	Other	2309 RIVER RIDGE ROAD	Deland	AE
SJR Cruises Canoe Rental - Blue Spring State Park	Other	2100 W. FRENCH AVE	Orange City	AE
Storage - Hontoon Island State Park - DeLand	Other	2309 RIVER RIDGE ROAD	Deland	AE
Visitor Program Building - Tomoka Springs	Other	2099 N BEACH STREET	Ormond Beach	AE
Fifth District Court of Appeal	Office	300 South Beach Street	Daytona Beach	AE
Office Modular - Tomoka State Park	Office	2099 N. Beach Street	Ormond Beach	AE
Tiger Bay State Forest Headquarters- D10- Daytona	Office	4316 WEST INTERNATIONAL SPEEDWAY BLVD.	Daytona Beach	A
Main Building	Penal	3601 US Highway 92	Daytona Beach	A
Multi-Purpose	Penal	1001 W. HWY 98	Apalachicola	A
Pavilion-Hobby Craft	Penal	3601 US Highway 92	Daytona Beach	A
Plant-Sewage Treatment	Penal	3601 US Highway 92	Daytona Beach	A
Shed-Water Pump	Penal	3601 US Highway 92	Daytona Beach	A
Storage (Property)	Penal	3601 US Highway 92	Daytona Beach	A
Storage (Tools)	Penal	3601 US Highway 92	Daytona Beach	A
Storage (Toxic Material)	Penal	3601 US Highway 92	Daytona Beach	A
Volusia RJDC - Detention-Jac	Penal	3840 OLD DELAND ROAD	Daytona Beach	A
Work Release Center	Penal	3601 US Highway 92	Daytona Beach	A
Ashby Forestry Site- Residence - D10	Residential	1695 PELL ROAD	Osteen	A
Building #1 - Hawk	Residential	1725 FIFTH STREET	Daytona Beach	AH
Building #2 - Eagle	Residential	1725 FIFTH STREET	Daytona Beach	AH
Ranger Residence - DeLeon Springs SP	Residential	601 PONCE DELEON BLVD.	De Leon Springs	AE
Ashby Forestry Site- Restroom/Storage- D12	Unconditioned Storage	1625 PELL ROAD	Osteen	A
Carport - Parking Lot	Unconditioned Storage	2309 River Ridge Road	Deland	AE
Pavilion-Picnic - Hontoon Island SP	Unenclosed Structure	2309 RIVER RIDGE ROAD	Deland	AE
Restroom/Picnic Shelter -Nocorroco-Tomoka	Unenclosed Structure	2099 N BEACH STREET	Ormond Beach	AE
Shed-Pole Barn - D10 - Daytona Beach	Unenclosed Structure	4316 WEST INTERNATIONAL SPEEDWAY BLVD.	Daytona Beach	A
Shop/Equip Shed - Hontoon Island SP	Utility	2309 RIVER RIDGE ROAD	Deland	AE
Storage - DeLeon Springs	Utility	601 PONCE DELEON BLVD	De Leon Springs	AE
Storage (Flammable) - Hontoon Island SP	Utility	2309 RIVER RIDGE ROAD	Deland	AE
Tiger Bay State Forest Headquarters- Pumphouse-D10	Utility	4316 WEST INTERNATIONAL SPEEDWAY BLVD.	Daytona Beach	A
Volusia RJDC - Maintenance Shed	Utility	3840 OLD DELAND ROAD	Daytona Beach	A
Volusia RJDC - Shed/Generator	Utility	3840 OLD DELAND ROAD	Daytona Beach	A
ARNG Vehicle Maint	Workshop	405 S. BASIN STREET	Daytona Beach	AE
Crew DOT	Workshop	1651 KEPLER RD	Deland	A

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations by Jurisdiction

Facility Name	Address	Jurisdiction
None Provided	2402 W INTL SPEEDWAY BLVD	Daytona Beach
None Provided	303 FENTRESS BLVD	Daytona Beach
None Provided	110 EXECUTIVE DR	Daytona Beach
None Provided	122 MUIRFIELD DR	Daytona Beach
None Provided	278 FENTRESS BLVD	Daytona Beach
None Provided	270 INDIGO DR	Daytona Beach
None Provided	593 N WILLIAMSON BLVD	Daytona Beach
None Provided	598 FENTRESS BLVD	Daytona Beach
None Provided	321 BROWN PELICAN DR	Daytona Beach
None Provided	803 PELICAN BAY DR	Daytona Beach
None Provided	310 YORKTOWNE DR	Daytona Beach
None Provided	1198 PINE ST	Daytona Beach
None Provided	2040 BEVILLE RD	Daytona Beach
None Provided	115 FRANCES DR	Daytona Beach
None Provided	1307 BEVILLE RD	Daytona Beach
None Provided	1500 S CLYDE MORRIS BLVD	Daytona Beach
None Provided	1352 S CLYDE MORRIS BLVD	Daytona Beach
None Provided	1390 S NOVA RD	Daytona Beach
None Provided	1105 BEVILLE RD	Daytona Beach
None Provided	126 DIANNA DR	Daytona Beach
K2D31651	165 OAK TREE CIR	Daytona Beach
None Provided	600 S CLYDE MORRIS BLVD	Daytona Beach
None Provided	1612 RICHARD PETTY BLVD	Daytona Beach
None Provided	1181 INDIAN LAKE RD	Daytona Beach
523584772	507 N CLYDE MORRIS BLVD	Daytona Beach
None Provided	1700 DUNN AV	Daytona Beach
None Provided	301 WILSON AV	Daytona Beach
None Provided	326 PARKWAY ST	Daytona Beach
None Provided	923 MASON AV	Daytona Beach
None Provided	1 FLAGG ST	Daytona Beach
None Provided	1296 3RD ST	Daytona Beach
None Provided	1694 3RD ST	Daytona Beach
None Provided	1101 9TH ST	Daytona Beach
None Provided	739 LOOMIS AV	Daytona Beach
None Provided	395 N BEACH ST	Daytona Beach
None Provided	331 FAIRVIEW AV	Daytona Beach
None Provided	210 N SEGRAVE ST	Daytona Beach
None Provided	201 MAGNOLIA AV	Daytona Beach
None Provided	703 N BEACH ST	Daytona Beach
None Provided	1025 BEL AIRE DR	Daytona Beach
None Provided	104 UNIVERSITY BLVD	Daytona Beach
None Provided	433 AUBURN DR	Daytona Beach
None Provided	101 HARTFORD AV	Daytona Beach
16-07894-K	1392 WRIGHT ST	Daytona Beach
None Provided	1808 MASON AV	Daytona Beach
None Provided	503 S CLYDE MORRIS BLVD	Daytona Beach
None Provided	1011 DOWNEY AV	Daytona Beach
None Provided	121 BASIN ST	Daytona Beach
None Provided	403 BASIN ST	Daytona Beach
None Provided	501 BOSTWICK AV	Daytona Beach
None Provided	103 E ORANGE AV	Daytona Beach
POWER SOURCE FOR LS	101 E MAGNOLIA AV	Daytona Beach
None Provided	30 GOODALL AV	Daytona Beach

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
None Provided	322 REVILO BLVD	Daytona Beach
None Provided	859 MALEY ST	Daytona Beach
None Provided	13 S OCEAN AV	Daytona Beach
None Provided	510 ORA ST	Daytona Beach
None Provided	10 FOUNTAINEBLEAU CIR	Daytona Beach
None Provided	708 WASHINGTON ST	Daytona Beach
None Provided	219 MARION ST	Daytona Beach
None Provided	247 N MARTIN LUTHER KING BLVD	Daytona Beach
6" flange with Bypass inst. 01/2014	386 EUCLID AV	Daytona Beach
None Provided	1700 HOPE DR	Daytona Beach
None Provided	1908 1/2 SUNNYPALM DR	Daytona Beach
None Provided	1317 1/2 AVENUE D	Daytona Beach
None Provided	690 WELLINGTON STATION BLVD	Daytona Beach
None Provided	1331 HAND AV	Daytona Beach
None Provided	3098 W INTL SPEEDWAY BLVD	Daytona Beach
None Provided	1210 BELLEVUE AV	Daytona Beach
None Provided	1608 N WILLIAMSON BLVD	Daytona Beach
None Provided	1790 TECHNOLOGY BLVD	Daytona Beach
None Provided	647 SHADY PL	Daytona Beach
797951	1371 S PALMETTO AV	Daytona Beach
None Provided	2203 W INTL SPEEDWAY BLVD	Daytona Beach
None Provided	553 S MARTIN LUTHER KING BLVD	Daytona Beach
None Provided	790 TOWNSEND AV	Daytona Beach
None Provided	829 WASHINGTON ST	Daytona Beach
None Provided	200 SEA DUCK DR	Daytona Beach
None Provided	843 GATEPARK DR	Daytona Beach
None Provided	1700 HOPE DR	Daytona Beach
None Provided	599 SEA DUCK DR	Daytona Beach
None Provided	1551 ROOSEVELT BLVD	Daytona Beach
None Provided	577 CHAMPIONS DR	Daytona Beach
None Provided	2912 BELLEVUE RD	Daytona Beach
None Provided	939 CHAMPIONS DR	Daytona Beach
None Provided	1328 INDIAN LAKE RD	Daytona Beach
None Provided	1471 CORNERSTONE BLVD	Daytona Beach
None Provided	250 TOURNAMENT DR	Daytona Beach
None Provided	113 TUSCANY BEND ST	Daytona Beach
None Provided	301 INDUSTRIAL PKWY	Daytona Beach
None Provided	3879 TIGER BAY RD	Daytona Beach
None Provided	1170 RED JOHN RD	Daytona Beach
None Provided	40 PERFECT DR	Daytona Beach
None Provided	1184 N TOMOKA FARMS RD	Daytona Beach
None Provided	1500 N TOMOKA FARMS RD	Daytona Beach
None Provided	2448 MASON AV	Daytona Beach
None Provided	2021 DUNN AV	Daytona Beach
None Provided	308 GRAND PRESERVE WAY	Daytona Beach
None Provided	2024 STRICKLAND RANGE RD	Daytona Beach
None Provided	2629 LPG A BLVD	Daytona Beach
None Provided	3962 LPG A BLVD	Daytona Beach
None Provided	620 HOLLY ST	Daytona Beach
None Provided	100 LAKE SIDE PROFESSIONAL BLVD	Daytona Beach
None Provided	128 BOTEFUHR AV	Daytona Beach
None Provided	148 BOYNTON BLVD	Daytona Beach
None Provided	2328 CRESCENT RIDGE RD	Daytona Beach

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
None Provided	175 SEA SPRAY ST	Daytona Beach
None Provided	2730 DACH AV	Daytona Beach
None Provided	16 JEFFERSON LANDING	Daytona Beach
None Provided	2063 S HALIFAX DR	Daytona Beach
None Provided	2206 1/2 S PENINSULA DR	Daytona Beach
None Provided	16 ELIZABETH LN	Daytona Beach
None Provided	2251 S HALIFAX DR	Daytona Beach
None Provided	2431 DODGE DR	Daytona Beach
None Provided	12 GRANVILLE CIR	Daytona Beach
None Provided	310 INTERNATIONAL GOLF DR	Daytona Beach
None Provided	275 BAYBERRY LAKES BLVD	Daytona Beach
None Provided	481 BAYBERRY LAKES BLVD	Daytona Beach
16-0000-A	1 SHADY PL	Daytona Beach
None Provided	100 CINDERBERRY LN	Daytona Beach
None Provided	221 N BEACH ST	Daytona Beach
None Provided	133 CATRIONA DR	Daytona Beach
None Provided	125 GRANDE LAKE DR	Daytona Beach
None Provided	716 WILDER BLVD	Daytona Beach
None Provided	1853 S CLYDE MORRIS BLVD	Daytona Beach
None Provided	764 N TOMOKA FARMS RD	Daytona Beach
None Provided	325 N BEACH ST	Daytona Beach
None Provided	851 CHAMPIONS DR	Daytona Beach
None Provided	2217 MASON AV	Daytona Beach
None Provided	301 N TOMOKA FARMS RD	Daytona Beach
Tuscany Woods Phase 2	446 TUSCANY CHASE DR	Daytona Beach
COUNTY	None Provided	Daytona Beach
COUNTY	None Provided	Daytona Beach
COUNTY	PRINCE OF PEACE CHURCH	Daytona Beach
None Provided	345 MEMORIAL MEDICAL PKWY	Daytona Beach
COUNTY	None Provided	Daytona Beach
PRIVATE	None Provided	Daytona Beach
PRIVATE	None Provided	Daytona Beach
PRIVATE	None Provided	Daytona Beach
PRIVATE	None Provided	Daytona Beach
OLD-LS 29 NOW PRIVATELY OWNED BY DIS	DAYTONA INTERNATIONAL SPEEDWAY	Daytona Beach
PRIVATE	None Provided	Daytona Beach
None Provided	1608 N CLYDE MORRIS BLVD	Daytona Beach
PRIVATE	LPGA BLVD (& JIMMY ANN DRIVE)	Daytona Beach
PRIVATE	Life Mobile Home Park	Daytona Beach
PRIVATE	960 S Williamson Blvd	Daytona Beach
None Provided	1613 FLOMICH AVE	Daytona Beach
None Provided	126 E Orange Ave	Daytona Beach
PRIVATE	DIS - Turn 1	Daytona Beach
PRIVATE BACK-US FOR LS-529	EMERGENCY PUMP STATION	Daytona Beach
CONNECTS MH 529-27 TO MH 28, 29 & 30	DAYTONA INTERNATIONAL SPEEDWAY	Daytona Beach
None Provided	882 TOURNAMENT DRIVE	Daytona Beach
IN PLANT PUMP STATION #1	3651 LPGA BLVD	Daytona Beach
PRIVATE HOMA MODEL#GRP26S/3/C	984 N WILLIAMSON BLVD	Daytona Beach
Whitewood	1145 Whitewood	Deltona
Antilles	0 Antilles Terrace	Deltona
Deltona Plaza	Deltona Plaza	Deltona
Fountainhead	1192 Deltona Blvd	Deltona
Motel	0 Welcome Cen. Dr.	Deltona

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
Bristol Ct	255 Enterprise Road	Deltona
Waycross	1678 Waycross	Deltona
Vivian Ct	1743 Vivian Ct	Deltona
Gainesville	1510 Gainesville	Deltona
Briarwood	1299 Briarwood	Deltona
Bloomfield	1681 Bloomfield	Deltona
Elkcam	2700 Elkcam	Deltona
Jessamine	2637 Elkcam	Deltona
2008 Canal	2008 Canal	Deltona
Florida Drive	2250 Florida Drive	Deltona
Enterprise Elementary	3rd Street	Deltona
Kendall Ct	2132 Kendall Ct	Deltona
Sable Ct	2411 Sable Ct	Deltona
Winn Dixie	1215 Providence Blvd	Deltona
Ponce DeLeon Plaza	1870 Providence Blvd	Deltona
Deltona Health Care	1851 Elkcam Blvd	Deltona
Condo B	Providence Blvd	Deltona
Condo A	0 Perimeter Drive	Deltona
Deltona Elementary	2022 Adella Blvd	Deltona
Eric Jason Ct	Eric Jason Ct	Deltona
Cardinal	2911 Cardinal Rd	Deltona
IHOP	326 Dirkson Rd	Deltona
River Oaks	355 Dirkson Rd	Deltona
Discovery Elementary	975 Abigail Drive	Deltona
Autumn Woods	183 Autumn Ridge	Deltona
Save-a-lot	Courtland/Howland	Deltona
Publix	2058 Saxon	Deltona
Sterling Park	1700 Sterling Park	Deltona
Twin Lakes	638 Copper Beach	Deltona
Saxon Ridge	442 Haversham Rd	Deltona
Cowentry Estates	397 Elizabeth St	Deltona
CITY HALL LIFT STATION #58	2345 Providence Blvd	Deltona
Spirit Elementary	1500 Meadowlark	Deltona
Sunrise Elementary	3155 Phoenetia	Deltona
Forest Lake Elementary	1600 Doyle Road	Deltona
Osteen Elementary	500 Doyle Road	Deltona
Pine Ridge High School	926 Howland Blvd	Deltona
Live Oaks	925 Blue River	Deltona
Pride Elementary	1100 Learning Lane	Deltona
Lake Baton	1300 Lake Baton Drive	Deltona
Thornby Park	110 Providence Blvd	Deltona
ZUBER LIFT STATION # 1	551 COMMONWEALTH BLVD # LS-1	Port Orange
ISABELLE LIFT STATION #2 & RTU	5132 ISABELLE AVE # LS-2	Port Orange
CYPRESS HEAD #1 LIFT STATION #3	6251 S WILLIAMSON BLVD # LS-3	Port Orange
STERLING CHASE LIFT STATION #4	6085 PHEASANT RIDGE DR # LS-4	Port Orange
CHARLES STREET LIFT STATION #5 & RTU	1000 CHARLES ST # LS-5	Port Orange
OCEANS LIFT STATION #6 & RTU	100 OCEAN AVE # LS-6	Port Orange
BARNETT BANK LIFT STATION #7 & RTU	4382 HALIFAX DR # LS-7	Port Orange
CYPRESS HEAD #2 LIFT STATION #8	6410 CYPRESS SPRINGS PKWY #LS 8	Port Orange
HALIFAX EST LIFT STATION #9 & RTU	1206 SPARTON AVE # LS-9	Port Orange
NIXON/BIRO LIFT STATION #10	850 NIXON LN # LS-10	Port Orange
CHRISTIANCY LIFT STATION # 11 & RTU & GENERATOR	5403 CHRISTIANCY AVE # LS-11	Port Orange
ATLANTIC HIGH SCHOOL LIFT STATION #12 & RTU	1250 REED CANAL RD # LS-12	Port Orange

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
SUMMERTREES SOUTH LIFT STATION #13 & RTU	6037 WINDING RIDGE LN # LS-13	Port Orange
PARKWOOD LIFT STATION #14 & RTU	1201 VAGABOND DR # WS 1TS NVA # LS14	Port Orange
SABLE CREEK LIFT STATION #15 & RTU	6103 SABAL CREEK BLVD # LS-15	Port Orange
SAWGRASS POINT LIFT STATION #16	5995 SAWGRASS POINT DR # LS-16	Port Orange
VINEYARDS LIFT STATION #17 & RTU	1480 TAYLOR RD # LS-17	Port Orange
CAMBRIDGE EST LIFT STATION #18 & RTU	220 N BRIGHTON DR # LS-18	Port Orange
BEACON WOODS LIFT STATION #19	3634 DONNA ST # LS-19	Port Orange
NORMAN ST LIFT STATION #20 & RTU	5032 RIVERSIDE DR # LS-20	Port Orange
SPRUCE CREEK HIGH LIFT STATION #21	801 TAYLOR RD # LS-21	Port Orange
SOUTHERN PINE LIFT STATION #22 & RTU	28 ELDA LN SWC LAWRENCE CT # LS-22	Port Orange
CAMBRIDGE WILLAS #23 & RTU (CENTER OF ROAD)	435 WILTSHIRE BLVD # NS 200E MYSTIC #LS-23	Port Orange
SUMMERTREES LIFT STATION #24 & RTU	5950 S WILLIAMSON BLVD # LS-24	Port Orange
SANCTUARY LIFT STATION #25 & RTU	6126 SANCTUARY GARDEN BLVD #LS 25	Port Orange
HARBOUR POINT LIFT STATION #26 & RTU	1201 HARBOUR POINT DR # LS-26	Port Orange
DEEP FOREST LIFT STATION #27 & RTU	921 SANDCREST DR #NEC #LS-27	Port Orange
SLEEPY HOLLOW LIFT STATION #28	700 SLEEPY HOLLOW DR # LS-28	Port Orange
MAPLEWOOD LIFT STATION #29 & RTU	4075 CHAMBERLIN BLVD # LS-29	Port Orange
RAVENWOOD LIFT STATION #30 & RTU	2 WOODSIDE DR # LS-30	Port Orange
WEST PORT SQ LIFT STATION #31 & RTU	5798 S WILLIAMSON BLVD #LS-31	Port Orange
FOXBORO #1 LIFT STATION #32 & RTU	5795 DEVON ST #LS-32	Port Orange
LAURELWOOD LIFT STATION #33	717 LARADO DR # LS-33	Port Orange
GOLDEN POND LIFT STATION #34 & RTU	6200 SPRUCE CREEK RD # LS-34	Port Orange
WOODS LIFT STATION #35 & RTU	1167 APPLE CT # N END #LS-35	Port Orange
WILLOW RUN #1 LIFT STATION #36 & RTU	1105 W WILLOW RUN DR # LS-36	Port Orange
SWEETWATER HILLS LIFT STATION #37 & RTU	763 TUMBLEBROOK DR # NWC BRNCH #LS-37	Port Orange
WATER EDGE #2 LIFT STATION #38	1698 CREEKWATER BLVD #LS-38	Port Orange
NOVA & HERBER LIFT STATION #39 & GENERATOR	3655 S NOVA RD # LS-39	Port Orange
SUGAR FOREST LIFT STATION #40 & RTU	800 SUGAR HOUSE BLVD # LS-40	Port Orange
LAMPLIGHTER LIFT STATION #41	3202 S NOVA RD # LS-41	Port Orange
WATER EDGE #1 LIFT STATION #42 & RTU	1750 NILOUFAR LN #LS-42	Port Orange
CENTRAL PARK LIFT STATION #43 & RTU	520 CENTRAL PARK BLVD #SWC #LS-43	Port Orange
BRANDY HILLS LIFT STATION #44	1058 TOMPKINS DR #SS AT END #LS-44	Port Orange
CRANE LAKE #1 LIFT STATION #45	1851 CRANE POINT DR # LS-45	Port Orange
COUNTRYSIDE LIFT STATION #46 & GENERATOR	633 TAYLOR RD # LS-46	Port Orange
HAWKS RIDGE LIFT STATION #47 & RTU	782 OSPREY DR # LS-47	Port Orange
RIVERWOOD LIFT STATION #48 & RTU	6148 DEL MAR DR # LS-48	Port Orange
SOUTHWIND LIFT STATION #49	1481 MADELINE AVE # LS-49	Port Orange
WILLOW RUN #2 LIFT STATION #50	1249 FRANKLIN DR # NWC #LS-50	Port Orange
PICKWICK LIFT STATION #51	20 DOWNING DR # LS-51	Port Orange
FOREST LAKE LIFT STATION #52	1863 CHORPASH LN # LS-52	Port Orange
GLENWOOD VILLAGE LIFT STATION #55	4692 HIDDEN LAKE DR # LS-55	Port Orange
TOWN PARK #56 & RTU	1584 MADELINE AVE # LS-56	Port Orange
LA COSTA LIFT STATION #57	1151 LA COSTA VILLAGE BLVD #LS-57	Port Orange
CITY HALL LIFT STATION #58	1000 CITY CENTER CIR # LS-58	Port Orange
SAMM AVE LIFT STATION #59	980 CANAL VIEW BLVD # LS-59	Port Orange
CLARK'S LIFT STATION #60 & BUILD & GENERATOR	5891 S WILLIAMSON BLVD #LS-60	Port Orange
CAR WASH STATION #61	1784 DUNLAWTON AVE # LS-61	Port Orange
ANGLERS LIFT STATION #62	4863 ORANGE BLVD # LS-62	Port Orange
LANCEWOOD LIFT STATION #63	5658 LANCEWOOD DR # LS-63	Port Orange
TOWNHOMES WEST LIFT STATION #64 & RTU	3532 CREEKSIDE RD # LS-64	Port Orange
FALCON CREST LIFT STATION #65	6043 SPRUCE CREEK RD # LS-65	Port Orange
WEST BAYSHORE #2 LIFT STATION #66	5479 W BAYSHORE DR # LS-66	Port Orange
WEST BAYSHORE #1 LIFT STATION #67	5539 W BAYSHORE DR # LS-67	Port Orange

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
CROSS CREEK LIFT STATION #68	4603 SECRET RIVER TRL # LS-68	Port Orange
OAKLAND PARK LIFT STATION #69	432 BRAHMA LN # LS-69	Port Orange
INTRACOASTAL VILLAS #70	3333 S RIDGEWOOD AVE # LS-70	Port Orange
FOXBORO #2 LIFT STATION #71 & RTU	5561 MILES DR # LS-71	Port Orange
CRANE LAKES #2 LIFT STATION #72	1991 CRANE LAKES BLVD # LS-72	Port Orange
SHALLOW BROOK LIFT STATION #73	4551 ALDER DR # LS-73	Port Orange
SKY LAKE LIFT STATION #74	5932 BOGGS FORD RD # LS-74	Port Orange
GROVES LIFT STATION #75	3800 MADELINE AVE # LS-75	Port Orange
BAYWOOD LIFT STATION #76	401 BAYWOOD CIR # LS-76	Port Orange
WINDSOR HILLS LIFT STATION #77	5798 WINDSOR HILL DR # LS-77	Port Orange
EAST BAYSHORE LIFT STATION #78	75 E BAYSHORE DR # LS-78	Port Orange
RIVERSIDE LIFT STATION #79	5741 RIVERSIDE DR # LS-79	Port Orange
CEDAR LIFT STATION #80	4 CEDAR ST # LS-80	Port Orange
COMMONWEALTH LIFT STATION #81	114 COMMONWEALTH BLVD # LS-81	Port Orange
LOWE'S - GATEWAY LIFT STATION #82	1751 DUNLAWTON AVE # LS 82	Port Orange
MONARCH LIFT STATION #83 & RTU	5401 S WILLIAMSON BLVD # LS-83	Port Orange
PLANTATION I #85	1508 MCGINNIS AVE #LS-85	Port Orange
WHISPERING WOODS LIFT STATION #87	858 AIRPORT RD # LS-87	Port Orange
CORACI #88	1771 TOWN WEST BLVD	Port Orange
COQUINA COVE #89	1998 TOWN WEST BLVD	Port Orange
SUNSET COVE #90	3885 SUNSET COVE DRIVE	Port Orange
WATERS EDGE #3 #91	FORKMEAD LANE	Port Orange
BUTTERMILK #92	1151 BUTTERMILK LN # LS-92	Port Orange
BOURBON STREET #93	3860 BOURBON ST # LS-93	Port Orange
CRYSTAL LAKE #94	REED CANAL ROAD	Port Orange
SEABIRD ISLAND LIFT STATION #101	105 DUNLAWTON AVE NWC SEABIRD # LS-101	Port Orange
CORAL WAY LIFT STATION #102	63 DUNLAWTON AVE # LS-102	Port Orange
JADE WINDS LIFT STATION #103	3590 PENINSULA DR (3600)	Port Orange
OCEAN WAY #6 PONCE INLET #104	86 OCEAN WAY DR # LS-104	Port Orange
INLET POINT #8 PONCE INLET #105	4879 S PENINSULA DR # LS-105	Port Orange
P.I. LIFT STATION MASTER STATION #106 & RTU & GENERATOR	4668 S PENINSULA DR # LS-106	Port Orange
DEEP WATER PONCE INLET #107	133 INLET HARBOR RD # LS-107	Port Orange
LIGHTHOUSE SHORES #6 LIFT STATION PONCE INLET #108 & RTU	4752 S ATLANTIC AVE # LS-108	Port Orange
SEAGULL LANDING #3 LIFT STATION PONCE INLET #111	4431 S PENINSULA DR # LS-111	Port Orange
ANCHOR DR #2 PONCE INLET # 112	4354 S PENINSULA DR # LS-112	Port Orange
LAS OLAS #113	37 MAR AZUL N # LS-113	Port Orange
VENETIAN WAY SOUTH #114	230 S VENETIAN WAY # LS-114	Port Orange
SURFSIDE #115	3601 SURFSIDE TER # LS-115	Port Orange
CARDINAL #116	3812 CARDINAL BLVD LS-116	Port Orange
Hillcrest Lift station	0 Wedgewood Ct	Orange City
Sandlewood Lift station	2332 Sandlewood Dr	Orange City
Dresden Ct Lift station	410 Dresden Ct	Orange City
Pineview Lift station	631 Pineview Dr	Orange City
Sunburst RV Lift station	2300 E. Graves Ave	Orange City
Monastery Lift station	0 Monastery Rd	Orange City
Shadowridge Lift station	842 Loral Leaf Dr	Orange City
Irrigation Pond Lift station	2134 Hollowridge Dr	Orange City
Sherwood Oaks Lift station	401 Sherwood Oaks Rd	Orange City
Target Lift station	2575 Enterprise Rd	Orange City
Florida Hospital Lift station	1055 Saxon Blvd	Orange City
OCS Water Plant Lift station	743 Harley Strickland Blvd	Orange City
Steak & Shake Lift station	927 Saxon Blvd	Orange City
Home Depot Lift station	2370 Veterans Memorial Parkway	Orange City
Chick Fil A	1139 Saxon Blvd	Orange City
Oakhurst Lift station	1292 Ivy Lake Dr	Orange City
Deltona Memorial	Saxon Blvd.	Orange City
Well #1	Country Village	Orange City

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
Lift Station #1	Opposite 475 Carswell Avenue	Holly Hill
Lift Station #2	231 Riverside Drive	Holly Hill
Lift Station #3	504 Riverside Drive	Holly Hill
Lift Station #4	345 10th Street	Holly Hill
Lift Station #5	946 Riverside Drive	Holly Hill
Lift Station #6	1136 State Avenue	Holly Hill
Lift Station #7	1300 Riverside Drive	Holly Hill
Lift Station #8	State Avenue opposite 1641	Holly Hill
Lift Station #9	1601 Riverside Drive	Holly Hill
Lift Station #10	410 Dorothy Avenue	Holly Hill
Lift Station #10a	429 3rd Street	Holly Hill
Lift Station #11	440 Magnolia Avenue	Holly Hill
Lift Station #11a	702 Commercial Drive	Holly Hill
Lift Station #12	620 Center Lane	Holly Hill
Lift Station #13	397 Dubbs Drive	Holly Hill
Lift Station #14	660 6th Street	Holly Hill
Lift Station #15	619 S. Flamingo Drive	Holly Hill
Lift Station #16	834 8th Street	Holly Hill
Lift Station #17	566 10th Street	Holly Hill
Lift Station #17a	1017 Chippewa Trail	Holly Hill
Lift Station #17b	Great Oaks Circle	Holly Hill
Lift Station #18	460 Walker Street	Holly Hill
Lift Station #18a	1000 15th Street	Holly Hill
Lift Station #19	407 Flomich Street	Holly Hill
Lift Station #20	926 Flomich Street	Holly Hill
Lift Station #21	1000 Walker Street	Holly Hill
Lift Station #24	944 Alabama Avenue	Holly Hill
Lift Station #25	Riviera Country Club	Holly Hill
Lift Station #26	1600 Nova Road (Walgreen's)	Holly Hill
Lift Station #27	2020 Ridgewood Avenue	Holly Hill
Lift Station #28	1812 Ridgewood Avenue	Holly Hill
Dog Park Lift Station	980 Alabama Avenue	Holly Hill
1. CHUCK WALKER	190 E. WISCONSIN AVE.	DeLand
2. WALTS/GARFIELD	401 S. GARFIELD	DeLand
3. CRESCENT PARKWAY	905 CRESCENT PARKWAY	DeLand
4. PLYMOUTH/KANSAS	803 E. PLYMOUTH	DeLand
5. PENN/DELAWARE	629 DELAWARE N.	DeLand
6. JR. HIGH	217 N. DELAWARE	DeLand
7. WINN./THOMPSON	422 W. WINNEMISSETT	DeLand
8. ALABAMA	801 S. ALABAMA	DeLand
9. MONTGOMERY-GATOR PIT	123 S. MONTGOMERY	DeLand
10. MAY STREET	851 W. MAY STREET	DeLand
11. CANDLELIGHT	1039 OAKTREE LANE / Libson Pkwy	DeLand
12. PLYMOUTH/KENTUCKY	605 E. PLYMOUTH	DeLand
13. BLUE LAKE HEIGHTS	1352 CHRIS AVE.	DeLand
14. SAMBO'S	121 W. MANDARIN	DeLand
15. PLYMOUTH PLACE	1015 NEW BEDFORD	DeLand
16. HILL/BERESFORD	891 E. BERESFORD AVE.	DeLand
17. 44/RR	2461 W HY 44 AT RR	DeLand
18. STONE STREET	1100 N. STONE ST.	DeLand
19. BLUE LAKE SCHOOL ELEM.	1396 E. WISCONSIN	DeLand
20. LAKE LINDLEY	998 VILLAGE LAKE DR.	DeLand
21. MILLERS	1002 W. PLYMOUTH AVENUE	DeLand

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
22. NATURES WOOD	1226 NATURES WOODS BLVD. 4623993	DeLand
23. AIRPORT II	395 PISTOL RANGE RD.	DeLand
24. AIRPORT I	1501 LANGLEY AVE.	DeLand
25. BURGONE	1101 BURGOYNE RD.	DeLand
26. VALLEY FORGE	1100 VALLEY FORGE	DeLand
27. LAKE MAMIE	109 E. LAKE MAMIE RD.	DeLand
28. HIDDEN HILLS I	227 PALM COVE DR.	DeLand
29. HIDDEN HILLS II	4190 SPRING LAKE DR.	DeLand
30. TRAILS I	950 SHADY BRANCH TRAIL	DeLand
31. TRAILS II	34 OLD TREE LINE TRAIL	DeLand
32. RAINTREE	368 RAINTREE CIRCLE	DeLand
33. VOORHIS (OAKS)	1630 E. VOORHIS AVE.	DeLand
34. HILL/WALTS	400 S. HILL	DeLand
35. REGIONAL SHOPPING PL.	2659 REGIONAL SHOP. PLAZA	DeLand
36. GLENN EAGLES	101 S. GLENN EAGLES DR.	DeLand
37. HEATHER GLENN	1449 HEATHER GLENN DR.	DeLand
38. QUAIL HOLLOW	1860 HONTOON RD.	DeLand
39. ROSEWOOD	2660 GRACIE DR.	DeLand
40. WHISPERWOOD	3070 TURTLE DOVE TR.	DeLand
41. LEXINGTON/RAINES	1425 INTERNATIONAL SPDWY.	DeLand
42. CHURCH ADAMS	807 E. CHURCH	DeLand
43. CASCADES	1025 CLEAR LAKE/1201S. SR 15A	DeLand
44. ARIZONA (VICTORIA PL)	410 BERWICK CIRCLE	DeLand
45. BENT OAKS	1557 ROCKWELL HGTS. DR.	DeLand
46. ATHENS	122 N. FLORIDA AVE.	DeLand
47. STORM STATION	1101 S. AMELIA AVE	DeLand
48. W. CAROLINA / ADELLE	422 W. CAROLINA AVE	DeLand
49. EAST BROOK	647 ASTORIA DR.	DeLand
50. LAKESHORE TRAILS	7754 ROYAL FERN CIR./0 WINTERBERRY	DeLand
51. SPRING ARBOR	1219 W. PLYMOUTH	DeLand
52. VICTORIA SQUARE	195 DODGE AVE.	DeLand
53. CROSSCREEK	1609 KINNAN TR	DeLand
54. SPRING HILL #1	492 W. MATHIS AVE.	DeLand
55. COUNTY FAIRGROUNDS	370 GOSSAMER RD	DeLand
56. COUNTY TRANSFER STATION	3151 E. NEW YORK AVE	DeLand
57. COMFORT INN	400 E. INTERNATL. SPDWY	DeLand
58. WINDROW BUILDING	1101 S. AMELIA AVE.	DeLand
59. N. STONE MEDICAL	1090 N. ORANGE AVE.	DeLand
60. WESTSIDE MASTER REPUMP	1001 N. HAZEN AVE.	DeLand
61. DIVISION/KENTUCKY	675 E. DIVISION ST.	DeLand
62. SOUTH POINT COMMONS	2470 S. WOODLAND BLVD.	DeLand
63. NORTHGATE	295 E. INTERNATL. SPDWY.	DeLand
64. PLUMOSUS PARK	190 E. TAYLOR RD.	DeLand
65. BALTIMORE/CLARA	1485 S. CLARA AVE.	DeLand
66. SAGO PARK	2395 N. WOODLAND BLVD.	DeLand
67. KEPLER RIDGE	2265 N. KEPLER RD.	DeLand
68. BLUE LAKE WOODS	1375 E. NEW YORK AVE	DeLand
69. AIR-TECH PARK	930 E. BISCAYNE	DeLand
70. BADCOCK HOME FURN.	1631 STATE RD. 15A	DeLand
71. ARVIDA MASTER PUMP	1280 E. TAYLOR RD.	DeLand
72. CAMPGROUND	1898 SKYDIVE DR.	DeLand
73. PARADE CIRCLE	1660 PARADE CIRCLE	DeLand
74. WALGREENS	117 E. ROSEHILL AVE.	DeLand

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
75. FREEDOM ELEMENTRY	1395 S. BLUE LAKE AVE.	DeLand
76. DOT OFFICES	1650 KEPLER AVE.	DeLand
77. CRYSTAL COVE	2337 CRYSTAL OAK DR.	DeLand
78. VICTORIA PARK COMMONS	2711 MARTIN LUTHER KING AV.	DeLand
79. VICTORIA PARK HILLS	1385 ORANGE CAMP RD.	DeLand
80. GEO. MARKS ELEMENTARY	1000 N. GARFIELD AVE.	DeLand
81. DELAND HIGH SCHOOL	800 OLD N. HILL AVE.	DeLand
82. WATERFORD LAKES	409 S. LAKE LINDLEY	DeLand
83. NSB HANGERS	2000 OLD DAYTONA RD	DeLand
84. SW MIDDLE SCHOOL	605 W. NEW HAMPSHIRE AVE	DeLand
85. LAKES OF DeLAND I	3562 AQUAMARINE DR.	DeLand
86. N. FIRE STATION	257 W. INT. SPDWY BLVD.	DeLand
87. WILLOW RIDGE	000 E. MINNESOTA	DeLand
88. VICTORIA GARDENS I	1134 HERON POINT WAY	DeLand
89. VICTORIA HILLS II	1805 BLUE LAKE AVE	DeLand
90. WOODS AT SOUTHRIDGE	811 E. BEREFORD AVE.	DeLand
91. LAKES OF DeLAND II	832 JADE PRKWY	DeLand
92. CARRIAGE APTS.	213 DYSON DRIVE	DeLand
93. FOREST TRACE	1501 W. MINNESOTA AVE	DeLand
94. GLENNWOOD SPRINGS	1305 WEYMOUTH DR.	DeLand
95. BERRYS RIDGE	3757 AIRPORT RD.	DeLand
96. NORTH RIDGE	125 BLANCO DR.	DeLand
97. PARKMORE MANOR	776 ASTORIA DR.	DeLand
98. HERITAGE PLACE	810 DEERFERN AVE.	DeLand
99. RIDGEWOOD CROSSING	401 S. RIDGEWOOD AVE.	DeLand
100. WP #9 / SE FIREHOUSE	1483 E. TAYLOR RD	DeLand
101. SADDLEBROOK RESERVE	134 SADDLEBROOK WAY	DeLand
102. MALLORY SQUARE	621 N. HAZEN RD	DeLand
103. DeLAND CROSSING	3051 E. NEW YORK AVE	DeLand
104. CLARA PLACE APTS.	318 W. NEW HAMPSHIRE AVE.	DeLand
105. VICTORIA FARMS NW	202 E. CHERRY PLACE	DeLand
106. THE ENCLAVE	133 CASSABELLA BLVD.	DeLand
107. COUNTRY CLUB VILLAS	52 BARRINGTON AVE.	DeLand
108. WELLINGTON WOODS	501 ORANGE CAMP AVE	DeLand
109. WOODLAND CROSSING	1706 N. WOODLAND BLVD.	DeLand
110. THE HIGHLANDS	305 SOUTHERN WINDS BLVD.	DeLand
111. BRANDY/TRAILS MASTER	465 E. LAKE MAMIE AVE	DeLand
112. CLARA / CALVIN	1175 S. CLARA AVE	DeLand
113. NORTH ACCESS RD I	2123 EDSON DR.	DeLand
114. NORTH ACCESS RD II	2245 EDSON DR.	DeLand
115. CITRUS GROVE ELEMENTRY	729 N. HAZEN AVE.	DeLand
116. TAYLOR PLACE APTS	1573-101 S. WOODLAND BLVD.	DeLand
117. ST. JOHN'S MARINA	NONE PROVIDED	DeLand
118. HAMPTON INN	30 SUMMIT PLACE	DeLand
119. COUNTRY CLUB CORNERS	NONE PROVIDED	DeLand
120. COUNTRY CLUB CORNERS II	NONE PROVIDED	DeLand
121. I4/44 BUSINESS CENTER	NONE PROVIDED	DeLand
KEPLER OAKS	NONE PROVIDED	DeLand
TWELVE OAKS I	NONE PROVIDED	DeLand
SPRINGWOOD TOWNHOMES	NONE PROVIDED	DeLand
VICTORIA HILLS III	NONE PROVIDED	DeLand
OAK HAMMOCK RESERVE	NONE PROVIDED	DeLand
TWELVE OAKS II	NONE PROVIDED	DeLand

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Lift and Pump Stations (Continued)

Facility Name	Address	Jurisdiction
BERESFORD WOODS	NONE PROVIDED	DeLand
GARDEN CROSSING	NONE PROVIDED	DeLand
THEATRES MULTIPLEX	NONE PROVIDED	DeLand
RIVERWALK ESTATES	NONE PROVIDED	DeLand
THE WARNERS	NONE PROVIDED	DeLand
PELHAM SQUARE ESTATES	NONE PROVIDED	DeLand
TAYLOR ESTATES	NONE PROVIDED	DeLand
ROYAL OAKS	NONE PROVIDED	DeLand
HUNTINGTON DOWNS	NONE PROVIDED	DeLand
SIX ACRE SUBDIVISION	NONE PROVIDED	DeLand
OAK LANDING	NONE PROVIDED	DeLand
IVANHOE CENTRAL	NONE PROVIDED	DeLand
MILL LAKE STATION	291 BLUE SPRINGS AVENUE	Orange City
INDUSTRIAL DRIVE STATION	259 INDUSTRIAL DRIVE	Orange City
KINGS LAKE STATION	305 KINGS LAKE DRIVE	DeBary
LAKE CHARLES STATION	HIGHLAND AVENUE	DeBary
LAKE SUSAN STATION	96 US HIGHWAY 17-92	DeBary
DGCC ENTRANCE POND STATION	100 DEBARY PLANTATION BLVD	DeBary
QUAIL LAKE STATION	CADDIE DRIVE	DeBary
NO NAME LAKE STATION	HIGHBANKS ROAD	DeBary
Station 1	1690 S. Palmetto Avenue	South Daytona
Station 2	501 Big Tree Road	South Daytona
Station 3	200 Ridge Boulevard	South Daytona
Station 4	2326 Anastasia Drive	South Daytona
Station 5	635 Violet Street	South Daytona
Station 6	808 Valencia Road	South Daytona
Station 7	586 Brook Circle	South Daytona
Station 8	2451 S Ridgewood Avenue	South Daytona
Station 9	29 Sandusky Circle	South Daytona
Station 10	918 Reed Canal Road	South Daytona
Station 11	8 1/2 Spinnaker Circle	South Daytona
Station 12	2025 Hickorywood Drive	South Daytona
Station 13	2938 Lantern Drive	South Daytona
Station 14	794 Aspen Drive	South Daytona
Station 15	2936 Foxcroft Lane	South Daytona
Station 16	407 Banana Cay Drive	South Daytona
Station 17	1610 Magnolia Avenue	South Daytona
Station 18	115 Bryan Cave Road	South Daytona
Station 19	765 Big Tree Road	South Daytona
Station 20	1017 Green Acres Circle	South Daytona
Station 21	2302 S. Nova Road	South Daytona
Station 22	3198 S. Nova Road	South Daytona

## APPENDIX E: CRITICAL FACILITY VULNERABILITY ASSESSMENT

### Additional Addendum: Daytona Beach Fuel Tanks

The following table lists the fuel tanks located within the City of Daytona Beach, Florida.

Facility ID	SITE NAME	TANK ATTRIBUTES	HOURS OF OPERATION	REQUIRES TRUCK WITH PUMP	CODB PROJECT MANAGER
9700983	Bethune Point WWTP 1 Shady PL Daytona Beach, FL 32114	1 ea. 6,000 gal. Vehicular Diesel Double walled (DW) steel AST. 1 ea. 1,000 gal. Vehicular Diesel Doubled walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
8631491	Fire Station #3 945 N. Halifax Ave. Daytona Beach, FL 32114	1 ea. 1,000 gal. Vehicular Diesel Double walled (DW) fiberglass UST	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
9812157	Police Dept 129 Valor Blvd. Daytona Beach, FL 32114	1ea, 6000 gal Vehicular diesel Double walled	7am-5pm-5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
8622691	Westside Regional WWTP 3651 LPGA Blvd. Daytona Beach, FL 32117	2 ea. 6,000 gal. Vehicular diesel Double walled (DW) steel AST. 1 ea. 4,000 gal. Vehicular Diesel Double walled (DW) steel AST. 1 ea. 12,000 gal. Vehicular Diesel Double walled (DW) steel UST. 1 ea. 12,000 gal. Unleaded Gas Double Walled (DW) steel UST.	7am-5pm, 5 days	Yes  Yes  No  no	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
8622689	Public Works Complex 950 Bellevue Avenue Daytona Beach, FL 32114	2 ea. 12,000 gal. Unleaded gas Double walled (DW) steel AST. 1 ea. 12,000 gal. Vehicular Diesel Double walled (DW) steel AST. 1 ea. 2,000 gal. Unleaded gas Double walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
8517330	Golf & Country Club 600 Wilder Blvd. Daytona Beach, FL 32114	1 ea. 1,000 gal. Vehicular Diesel Double walled (DW) steel AST. 1ea. 2,000 gal. Unleaded Gas Double walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
9300590	Lift Station #1110 1612 Richard Petty Blvd. Daytona Beach, FL 32115	1 ea. 1,000 gal. Vehicular Diesel Double walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
8631492	Fire Station #4 1675 Mason Ave. Daytona Beach, FL 32114	1 ea. 1,000 gal. Vehicular Diesel Double walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
9300589	Lift Station #1162 2020 Beville Road Daytona Beach, FL 32115	1 ea. 1,000 gal. Vehicular Diesel Double walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us
9300588	Lift Station #1105 647 Shady Place Daytona Beach, FL 32114	1 ea. 1,000 gal. Vehicular Diesel Double walled (DW) steel AST.	7am-5pm, 5 days	Yes	Name: Tony Segreto Phone: 386-671-8712 Cell : 321-436-7479 Email: segretoa@codb.us

## APPENDIX F: INDIVIDUAL JURISDICTIONAL MITIGATION PLANS

The Mitigation Plans for all 17 jurisdictions within Volusia County are located in a live, online document in an attempt to streamline the updating process.

In addition to the Mitigation Action Plan (in section 9 of this report) which lists all active projects, there are a number of completed and terminated projects that are not included in this listing. The individual Jurisdictional Mitigation Plans can be found at the link below.

[Link to Mitigation Plans](#)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: DAYTONA BEACH

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Daytona Beach.

#### DAYTONA BEACH | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	5,287 14.7%	3,462 65.5% built	\$169,265,144	\$288,998,878	\$413,430,439	\$218,445,804
AE	9,417 26.1%	7,066 75.0% built	\$360,256,388	\$771,944,078	\$1,098,507,030	\$709,737,272
AH	987 2.7%	610 61.8% built	\$177,534,661	\$343,264,311	\$509,671,382	\$391,735,496
VE	333 0.9%	188 56.5% built	\$89,835,865	\$40,685,079	\$130,301,827	\$117,075,890

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	588 1.6%	447 76.0% built	\$144,966,980	\$77,376,586	\$216,416,298	\$173,969,397
Category 2	1,421 3.9%	1,067 75.1% built	\$205,954,228	\$135,464,419	\$335,491,379	\$260,121,003
Category 3	2,681 7.4%	2,060 76.8% built	\$275,377,068	\$242,950,662	\$512,400,462	\$370,187,566
Category 4	22,378 62.0%	18,056 80.7% built	\$706,573,628	\$1,181,296,469	\$1,879,619,479	\$1,343,079,797
Category 5	22,964 63.7%	18,538 81.7% built	\$758,182,934	\$1,219,367,858	\$1,957,862,250	\$1,400,988,001

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	24,578 68.1%	18,640 75.8% built	\$912,410,490	\$1,755,131,499	\$2,601,782,672	\$1,667,861,866
High Risk	2,531 7.0%	1,224 48.4% built	\$90,960,661	\$172,991,112	\$237,112,421	\$187,691,236
Very High Risk	8,960 24.8%	7,827 87.4% built	\$312,701,218	\$947,748,279	\$1,256,904,253	\$871,101,321

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

**JURISDICTION APPENDIX: DAYTONA BEACH SHORES**

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Daytona Beach Shores.

**DAYTONA BEACH SHORES | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones**

**Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones**

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	0 0%	0 0% built	\$0	\$0	\$0	\$0
AE	30 2.0%	28 93.3% built	\$10,589,634	\$8,695,227	\$19,237,666	\$18,171,848
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	271 18.0%	171 63.1% built	\$73,407,514	\$54,907,559	\$127,356,977	\$123,676,993

**Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones**

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	50 3.3%	40 80.0% built	\$25,272,677	\$29,117,768	\$54,343,250	\$50,762,714
Category 2	198 13.1%	148 74.7% built	\$61,595,963	\$48,300,541	\$108,891,213	\$104,716,488
Category 3	574 38.0%	409 71.3% built	\$97,338,912	\$74,654,524	\$170,988,145	\$160,630,722
Category 4	1,437 95.2%	1,084 75.4% built	\$142,289,889	\$124,955,524	\$265,892,247	\$241,101,088
Category 5	1,507 99.9%	1,130 75.0% built	\$143,824,929	\$127,896,758	\$270,368,521	\$245,577,362

**Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones**

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	1,509 100%	1,129 74.8% built	\$143,824,929	\$127,896,758	\$270,368,521	\$245,577,362
High Risk	0 0%	0 0% built	\$0	\$0	\$0	\$0
Very High Risk	0 0%	0 0% built	\$0	\$0	\$0	\$0

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: DEBARY

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within DeBary.

#### DEBARY | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	1,439 10.3%	1,030 71.6% built	\$43,169,557	\$84,954,512	\$124,674,496	\$104,545,259
AE	404 2.9%	184 45.5% built	\$40,819,538	\$23,221,849	\$57,993,973	\$49,819,499
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 2	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 3	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 4	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 5	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	426 3.0%	267 62.7% built	\$8,225,462	\$19,909,833	\$28,094,816	\$23,769,059
High Risk	5,836 41.7%	3,935 67.4% built	\$131,213,458	\$418,106,149	\$542,018,191	\$460,299,802
Very High Risk	7,736 55.3%	6,775 87.6% built	\$148,058,561	\$384,625,101	\$528,618,030	\$425,148,859

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: DELAND

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within DeLand.

#### DELAND | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	437 2.0%	175 40.0% built	\$33,883,182	\$22,482,643	\$81,507,669	\$37,074,177
AE	41 0.2%	36 87.8% built	\$2,814,931	\$12,562,858	\$15,377,789	\$10,939,077
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 2	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 3	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 4	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 5	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	9,761 44.6%	6,841 70.1% built	\$183,006,185	\$571,071,533	\$752,606,420	\$550,061,502
High Risk	2,088 9.5%	1,249 59.8% built	\$48,262,332	\$200,110,079	\$247,748,921	\$186,389,239
Very High Risk	10,043 45.9%	7,837 78.0% built	\$152,142,670	\$525,045,610	\$675,503,149	\$412,522,893

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: DELTONA

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Deltona.

#### DELTONA | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	2,718 5.8%	1,852 68.1% built	\$53,935,995	\$144,579,757	\$195,412,580	\$128,142,803
AE	3,807 8.2%	2,609 68.5% built	\$73,165,292	\$205,310,343	\$277,881,101	\$189,163,293
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 2	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 3	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 4	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 5	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	9,212 19.7%	7,197 78.1% built	\$103,811,302	\$379,498,415	\$475,037,432	\$352,681,976
High Risk	7,888 16.9%	3,919 49.7% built	\$86,110,991	\$286,601,565	\$371,234,286	\$275,294,707
Very High Risk	29,579 63.3%	24,088 81.4% built	\$331,280,197	\$1,510,060,811	\$1,837,903,238	\$1,318,532,684

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## JURISDICTION APPENDIX: EDGEWATER

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Edgewater.

### EDGEWATER | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

#### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	819 3.4%	198 24.2% built	\$65,523,046	\$16,141,860	\$67,217,533	\$56,331,725
AE	1,315 5.5%	1,054 80.2% built	\$78,851,982	\$64,477,142	\$141,501,628	\$118,662,752
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

#### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	302 1.3%	222 73.5% built	\$50,144,209	\$21,952,511	\$70,691,953	\$63,990,593
Category 2	665 2.8%	535 80.5% built	\$62,638,812	\$35,334,705	\$96,446,306	\$84,982,896
Category 3	18,449 77.5%	14,885 80.7% built	\$220,058,442	\$527,555,722	\$744,194,930	\$581,921,018
Category 4	23,598 99.2%	19,005 80.5% built	\$261,049,999	\$684,233,983	\$941,847,179	\$737,712,980
Category 5	23,728 99.7%	19,099 80.5% built	\$263,075,809	\$687,893,311	\$946,497,453	\$740,721,680

#### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	722 3.0%	417 57.8% built	\$70,571,007	\$25,718,880	\$82,111,410	\$78,284,550
High Risk	1,839 7.7%	754 41.0% built	\$34,445,730	\$53,808,436	\$86,722,766	\$71,058,852
Very High Risk	21,169 89.0%	17,929 84.7% built	\$211,076,090	\$608,133,504	\$817,322,223	\$631,150,892

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: HOLLY HILL

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Holly Hill.

#### HOLLY HILL | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	1,508 16.3%	1,248 82.8% built	\$13,988,399	\$52,104,403	\$66,041,791	\$49,257,642
AE	2,241 24.2%	1,802 80.4% built	\$69,337,975	\$120,138,518	\$188,777,990	\$145,962,064
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	190 2.1%	146 76.8% built	\$24,523,320	\$16,413,783	\$40,726,258	\$28,081,874
Category 2	249 2.7%	198 79.5% built	\$26,698,543	\$19,226,636	\$45,714,334	\$32,102,953
Category 3	379 4.1%	311 82.1% built	\$28,368,464	\$22,536,590	\$50,694,209	\$36,026,970
Category 4	8,858 95.8%	7,746 87.4% built	\$139,891,384	\$320,985,527	\$460,121,542	\$357,141,942
Category 5	9,201 99.5%	8,060 87.6% built	\$145,571,885	\$331,673,796	\$476,490,312	\$371,147,120

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	5,445 58.9%	4,888 89.8% built	\$96,953,715	\$182,140,688	\$278,870,875	\$224,899,453
High Risk	58 0.6%	27 46.6% built	\$1,027,469	\$1,899,763	\$2,927,232	\$2,183,691
Very High Risk	3,741 40.4%	3,185 85.1% built	\$49,660,352	\$150,718,353	\$199,846,864	\$149,198,135

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: LAKE HELEN

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Lake Helen.

#### LAKE HELEN | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	511 15.0%	246 48.1% built	\$13,854,096	\$15,222,471	\$28,109,727	\$20,788,805
AE	0 0%	0 0% built	\$0	\$0	\$0	\$0
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 2	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 3	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 4	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 5	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	168 4.9%	42 25.0% built	\$2,565,376	\$3,097,618	\$4,726,641	\$3,844,909
High Risk	593 17.4%	346 58.3% built	\$6,998,668	\$11,812,606	\$18,273,208	\$15,012,399
Very High Risk	2,643 28.6%	1,874 70.9% built	\$29,791,383	\$60,378,413	\$89,430,239	\$64,321,206

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: NEW SMYRNA BEACH

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within New Smyrna Beach.

#### NEW SMYRNA BEACH | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	1,039 4.3%	343 33.0% built	\$71,477,008	\$67,321,353	\$117,779,871	\$102,669,526
AE	7,754 3.2%	5,413 69.8% built	\$409,402,676	\$458,639,727	\$857,635,441	\$704,863,648
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	229 0.1%	137 59.8% built	\$63,472,915	\$27,874,186	\$83,462,284	\$72,637,221

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	3,093 12.9%	2,024 65.4% built	\$332,400,900	\$221,368,937	\$536,533,856	\$468,931,724
Category 2	7,848 32.6%	5,632 71.8% built	\$508,703,337	\$486,122,883	\$975,739,772	\$809,935,604
Category 3	19,714 82.0%	15,169 76.9% built	\$920,708,255	\$1,040,434,704	\$1,937,336,587	\$1,606,338,741
Category 4	20,212 84.1%	15,545 76.9% built	\$959,111,110	\$1,094,896,685	\$2,030,109,737	\$1,696,458,751
Category 5	20,653 85.9%	15,754 76.3% built	\$967,755,290	\$1,118,558,777	\$2,062,221,219	\$1,725,886,454

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	10,362 43.1%	7,810 75.4% built	\$740,224,540	\$687,193,882	\$1,390,690,105	\$1,238,614,843
High Risk	3,825 15.9%	2,288 59.8% built	\$139,862,776	\$233,335,746	\$367,065,558	\$315,001,291
Very High Risk	9,780 40.7%	7,734 79.1% built	\$220,896,446	\$495,655,741	\$714,687,464	\$540,142,591

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: OAK HILL

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Oak Hill.

#### OAK HILL | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	238 9.0%	108 45.4% built	\$4,109,272	\$4,646,236	\$8,045,667	\$5,635,010
AE	951 36.0%	584 61.4% built	\$50,898,265	\$29,013,942	\$78,862,660	\$58,506,483
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	4 0.2%	0 0% built	\$11,485,355	\$0	\$11,485,355	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	471 17.8%	337 71.5% built	\$51,578,263	\$15,886,107	\$66,831,257	\$40,818,072
Category 2	969 36.7%	585 60.4% built	\$62,465,885	\$28,095,386	\$90,511,724	\$58,619,692
Category 3	2,401 90.8%	1,322 55.1% built	\$78,841,171	\$55,443,310	\$132,772,484	\$89,485,519
Category 4	2,608 98.7%	1,465 56.2% built	\$80,300,807	\$59,018,687	\$137,746,347	\$92,941,029
Category 5	2,643 100%	1,494 56.5% built	\$80,476,610	\$59,586,282	\$138,489,745	\$93,380,646

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	153 5.8%	22 14.4% built	\$21,663,068	\$471,814	\$22,110,312	\$799,770
High Risk	1,224 46.3%	575 47.0% built	\$27,685,937	\$28,200,153	\$53,880,527	\$42,527,388
Very High Risk	1,258 47.6%	892 70.9% built	\$31,127,605	\$31,914,315	\$62,498,906	\$50,053,488

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: ORANGE CITY

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Orange City.

#### ORANGE CITY | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	103 1.1%	54 52.4% built	\$24,853,571	\$70,568,770	\$95,395,942	\$61,638,666
AE	0 0%	0 0% built	\$0	\$0	\$0	\$0
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 2	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 3	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 4	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 5	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	1,222 13.6%	378 30.9% built	\$39,253,306	\$49,355,022	\$88,581,841	\$82,230,144
High Risk	3,077 34.2%	556 18.1% built	\$60,157,463	\$166,533,054	\$226,690,517	\$166,865,591
Very High Risk	4,692 52.2%	3,695 78.8% built	\$96,424,274	\$236,972,094	\$333,364,764	\$246,841,073

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: ORMOND BEACH

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Ormond Beach.

#### ORMOND BEACH | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	1,876 5.4%	1,423 75.9% built	\$50,975,689	\$144,798,881	\$193,943,181	\$164,888,645
AE	8,800 25.5%	3,959 45.0% built	\$335,196,516	\$391,246,615	\$706,831,649	\$607,797,521
AH	51 0.1%	51 100% built	\$1,367,437	\$2,093,922	\$3,461,359	\$3,461,359
VE	201 5.8%	153 76.1% built	\$81,934,121	\$57,769,771	\$136,901,244	\$132,628,703

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	1,165 3.4%	861 73.9% built	\$197,266,464	\$132,515,752	\$324,060,626	\$285,951,063
Category 2	1,318 3.8%	950 72.1% built	\$204,533,133	\$146,218,710	\$345,003,581	\$305,170,111
Category 3	1,664 4.8%	1,242 74.6% built	\$256,188,810	\$193,293,653	\$443,070,025	\$392,086,787
Category 4	14,880 43.1%	13,015 87.5% built	\$650,428,019	\$944,603,930	\$1,584,762,219	\$1,341,074,410
Category 5	17,932 52.0%	15,643 87.2% built	\$755,875,876	\$1,195,715,492	\$1,940,597,184	\$1,644,468,017

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	11,983 34.7%	4,384 36.6% built	\$277,930,479	\$356,752,640	\$617,626,907	\$534,827,722
High Risk	7,033 20.4%	5,175 73.6% built	\$273,946,676	\$716,296,694	\$985,322,282	\$854,474,138
Very High Risk	15,432 44.7%	13,735 89.0% built	\$516,054,729	\$1,001,691,680	\$1,512,451,192	\$1,253,129,217

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: PIERSON

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Pierson.

#### PIERSON | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	328 8.7%	206 62.8% built	\$9,435,361	\$4,765,122	\$10,738,591	\$9,236,092
AE	0 0%	0 0% built	\$0	\$0	\$0	\$0
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 2	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 3	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 4	0 0%	0 0% built	\$0	\$0	\$0	\$0
Category 5	0 0%	0 0% built	\$0	\$0	\$0	\$0

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	205 5.5%	48 23.4% built	\$4,654,895	\$1,506,863	\$3,741,654	\$2,776,856
High Risk	2,896 77.2%	2,112 72.9% built	\$17,723,147	\$17,285,043	\$29,682,533	\$23,617,771
Very High Risk	647 17.2%	398 61.5% built	\$11,284,821	\$29,416,139	\$38,863,106	\$17,307,447

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: PONCE INLET

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Ponce Inlet.

#### PONCE INLET | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	0 0%	0 0% built	\$0	\$0	\$0	\$0
AE	980 40.4%	445 45.4% built	\$87,370,325	\$46,673,540	\$132,868,773	\$108,792,003
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	129 5.3%	51 39.5% built	\$35,850,666	\$10,195,202	\$45,276,030	\$37,934,080

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	785 32.3%	299 38.1% built	\$90,259,618	\$35,961,994	\$124,747,647	\$100,772,287
Category 2	1,036 42.7%	444 42.9% built	\$114,236,806	\$50,163,379	\$162,726,866	\$134,261,214
Category 3	2,053 84.6%	1,147 55.9% built	\$198,592,824	\$134,356,311	\$329,368,043	\$284,409,871
Category 4	2,425 99.9%	1,431 59.0% built	\$231,788,059	\$163,253,659	\$391,180,110	\$342,293,242
Category 5	2,428 100%	1,432 59.0% built	\$231,892,285	\$163,361,228	\$391,391,905	\$342,480,037

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	1,526 62.9%	987 64.7% built	\$150,967,689	\$113,760,330	\$262,578,063	\$239,680,234
High Risk	782 32.2%	436 55.8% built	\$80,916,471	\$49,600,898	\$128,805,717	\$102,843,103
Very High Risk	0 0%	0 0% built	\$0	\$0	\$0	\$0

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: PORT ORANGE

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Port Orange.

#### PORT ORANGE | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	911 3.1%	720 79.0% built	\$38,702,828	\$119,381,480	\$147,300,700	\$120,250,196
AE	6,965 23.9%	5,878 84.4% built	\$268,100,023	\$444,447,990	\$702,522,053	\$583,727,492
AH	3 0.01%	0 0% built	\$1,634,309	\$0	\$1,634,309	\$1,634,309
VE	9 0.03%	9 100% built	\$3,014,961	\$757,806	\$3,772,767	\$256,238

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	960 3.3%	694 72.3% built	\$91,699,679	\$48,778,052	\$134,503,579	\$100,322,949
Category 2	2,283 7.8%	1,820 79.7% built	\$121,668,823	\$104,189,141	\$219,490,038	\$170,550,894
Category 3	14,489 49.8%	12,436 85.8% built	\$378,170,737	\$705,527,473	\$1,075,994,916	\$871,180,764
Category 4	16,541 56.8%	14,323 86.6% built	433,321,425	\$912,981,469	\$1,336,556,023	\$1,074,236,823
Category 5	19,025 65.3%	16,530 86.9% built	\$504,680,680	\$1,185,586,882	\$1,678,718,471	\$1,337,830,629

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	12,051 41.4%	10,301 85.5% built	\$312,056,328	\$573,432,056	\$882,188,431	\$710,054,446
High Risk	7,150 24.6%	6,254 87.5% built	\$256,253,176	\$787,088,089	\$1,022,362,166	\$878,286,381
Very High Risk	9,869 33.9%	9,008 91.3% built	\$322,716,989	\$976,496,369	\$1,295,552,774	\$1,018,915,994

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: SOUTH DAYTONA

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within South Daytona.

#### SOUTH DAYTONA | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	878 12.9%	829 94.4% built	\$18,417,956	\$57,917,082	\$76,312,039	\$51,937,330
AE	1,906 27.9%	1,729 90.7% built	\$65,540,519	\$117,625,728	\$182,983,794	\$151,955,081
AH	0 0%	0 0% built	\$0	\$0	\$0	\$0
VE	120 1.8%	92 76.7% built	\$30,938,993	\$8,139,968	\$37,678,431	\$34,997,866

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	222 3.3%	185 83.3% built	\$45,626,336	\$15,259,646	\$59,305,470	\$53,810,537
Category 2	518 7.6%	425 82.0% built	\$54,583,545	\$33,663,357	\$86,666,390	\$78,108,248
Category 3	5,109 74.9%	4,704 92.1% built	\$155,096,228	\$287,367,358	\$440,776,665	\$357,106,597
Category 4	6,764 99.1%	6,151 90.9% built	\$182,872,713	\$248,839,256	\$534,514,595	\$430,513,711
Category 5	6,822 100%	6,195 90.8% built	\$183,249,781	\$249,865,412	\$535,917,819	\$431,423,934

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	6,306 92.4%	5,749 91.2% built	\$167,592,372	\$317,673,280	\$483,580,155	\$385,954,905
High Risk	277 4.1%	269 97.1% built	\$7,847,002	\$21,792,824	\$29,638,303	\$23,957,468
Very High Risk	239 3.5%	177 74.1% built	\$7,810,407	\$14,893,953	\$22,699,361	\$21,511,571

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX G: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) RISK AND VULNERABILITY

### JURISDICTION APPENDIX: UNINCORPORATED VOLUSIA

This Appendix further identifies the risk and vulnerability from the natural and man-made hazards in Volusia County. The following tables summarize financial exposure to hazard zones for flooding, storm surge and fire within Unincorporated Volusia County.

#### UNINCORPORATED VOLUSIA CO. | Financial Vulnerability to Flood, Storm Surge and Fire Risk Zones

##### Financial Exposure to Flood Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
A	57,305 27.2%	9,935 17.3% built	\$954,548,372	\$538,043,219	\$1,195,611,161	\$752,444,108
AE	14,500 6.9%	6,931 47.8% built	\$737,558,194	\$406,687,221	\$1,076,379,458	\$790,587,316
AH	309 0.1%	160 51.8% built	\$7,367,951	\$11,855,895	\$17,567,810	\$13,809,613
VE	341 0.2%	161 47.2% built	\$126,347,526	\$26,434,422	\$149,939,365	\$86,561,190

##### Financial Exposure to Storm Surge Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	4,337 2.1%	1,980 45.7% built	\$390,443,445	\$149,883,179	\$531,374,565	\$376,530,098
Category 2	8,765 4.2%	4,602 52.5% built	\$576,909,136	\$303,218,082	\$862,670,901	\$675,629,014
Category 3	19,963 9.5%	10,458 52.4% built	\$783,731,273	\$527,345,565	\$1,281,488,193	\$1,027,914,533
Category 4	28,867 13.7%	16,860 58.4% built	\$1,059,684,155	\$922,663,430	\$1,946,774,140	\$1,605,934,625
Category 5	35,755 17.0%	21,356 59.7% built	\$1,290,577,985	\$1,319,980,523	\$2,569,973,018	\$2,169,215,407

##### Financial Exposure to Fire Hazard Zones – Cumulative Financial Values within Zones

Hazard Zone	Parcels in Zone	Built Parcels	Land Value	Building Value	Assessed Value	Taxable Value
Low Risk	80,969 38.4%	15,484 19.1% built	\$1,274,205,908	\$652,198,734	\$1,633,984,851	\$1,119,584,167
High Risk	72,872 34.6%	31,911 43.8% built	\$1,111,843,358	\$1,581,324,392	\$2,551,932,720	\$2,014,170,541
Very High Risk	55,977 26.6%	43,281 77.3% built	\$979,961,130	\$1,760,690,902	\$2,713,865,063	\$2,207,277,575

Data Source(s): FEMA (Flood Data); NOAA (Storm Surge Data); HAZUS (Fire Data); Volusia County (2014 Parcels)

## APPENDIX H: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) CONSEQUENCES

This Appendix identifies the capabilities and potential consequences on a county scale to natural and man-made hazards in Volusia County.

### Core Capabilities by Hazard

The table below summarizes the core capabilities that are deemed ‘essential’ for Volusia County to maintain community control in the event that one or more of the hazards below will occur.

Core Capabilities	Wind	Storm Surge	Flood	Lightning	Tornado	Fire	Drought	Ext. Temp	Sea Lv. Rise	Pandemic	HazMat	Terrorism	
Access Control / ID Verif.										X		X	2
Community Resilience	X	X	X	X	X	X	X	X	X	X	X	X	12
Critical Transportation		X	X								X	X	4
Cybersecurity				X								X	2
Economic Recovery	X	X	X	X	X	X	X	X	X	X	X	X	12
Env. Response/Health/Safety	X	X	X	X	X	X	X	X	X	X	X	X	12
Fatality Management					X					X	X	X	4
Forensics/Attribution											X	X	2
Health/Social Services	X	X	X	X	X	X	X	X	X	X	X	X	12
Housing	X	X	X		X	X			X			X	7
Infrastructure Systems	X	X	X	X	X	X					X	X	8
Intelligence/Info Sharing										X	X	X	3
Interdiction/Disruption										X	X	X	3
L.T. Vulnerab. Reduction	X	X	X	X	X	X	X	X	X	X	X	X	12
Mass Care Services	X		X	X	X	X	X	X		X	X	X	10
Mass Search/Rescue	X	X	X		X	X				X	X	X	8
Nat./Cultural Resources	X	X	X	X	X	X					X	X	8
On-Scene Security/Prot.	X	X	X		X	X				X	X	X	8
Operational Communic.	X	X	X	X	X	X	X	X	X	X	X	X	12
Operational Coordinat'n.	X	X	X	X	X	X	X	X	X	X	X	X	12
Phys. Protective Measure										X		X	2
Planning	X	X	X	X	X	X	X	X	X	X	X	X	12
Public/Pvt. Services/Res.	X	X	X		X	X	X			X	X	X	9
Health/Medical Service	X	X	X	X	X	X	X	X	X	X	X	X	12
Public Info/Warning	X	X	X	X	X	X	X	X	X	X	X	X	12
Risk Resilience Mgmt.	X	X	X	X	X	X	X	X	X	X	X	X	12
Risk Mgmt-Programs	X	X	X	X	X	X	X	X	X	X	X	X	12
Screen/Search/Detection										X	X	X	3
Situational Assessment	X	X	X	X	X	X	X	X	X	X	X	X	12
Supple Chain Integrity										X		X	2
Threats/Hazard Identific.	X	X	X	X	X	X	X	X	X	X	X	X	12
	21	21	22	18	22	21	16	15	15	25	26	31	

### Top Core Capabilities by Number of Applicable Hazards

Community Resilience (12)	Operational Communication (12)	Risk Resilience Management (12)
Economic Recovery(12)	Operational Coordination (12)	Risk Management Programs (12)
Environmental Response (12)	Planning (12)	Situational Assessment (12)
Health/Social Services (12)	Health/Medical Services (12)	Threat/Hazard Identification (12)
Long Term Vulnerability Reduction (12)	Public Warning (12)	

### Top Hazards by Core Capabilities Affected

1. Terrorism (31)
2. HazMat (26)
3. Pandemic (25)
4. Tornado (22)
5. Flood (22)

### Resource Requirements and Target Capabilities by Hazard

This section of the report details the core capability targets and resource requirements for all natural, societal and technological hazards covered in the Local Mitigation Strategy. The tables provided for each hazard are based off of the template created as part of the Threat and Hazard Identification and Risk Assessment Guide (Second Edition) created by the U.S. Department of Homeland Security.

The following hazards are covered within this portion of the THIRA analysis:

- *Flood*
- *Fire*
- *Wind*
- *Storm Surge*
- *Tornado*
- *HazMat Incident*
- *Pandemic*

**APPENDIX H: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) CONSEQUENCES**

**Flood**

<b>Flooding</b>	
<b>Context Description</b>	A large tropical low has formed off of the coast of Florida and has been held stationary by the presence of a low pressure system moving southward from northern Florida for over three days. An estimated 50% of the parcels within Flood Zone 'A' are affected, 50% of the parcels within Flood Zones 'AH', 'AO' and 'AE' are affected, 75% of the parcels within Flood Zone 'VE' are affected, and 1% of the parcels within Flood Zone X (500-Year Floodplain) are affected. The storm affects the building and assessed values of the parcels hit by an estimated 10%.
<b>Core Capability</b>	
<b>Capability Target</b>	Community Resilience, Critical Transportation, Economic Recovery, Environmental Response, Health and Social Services, Housing, Infrastructure Systems, Long Term Vulnerability Reduction, Mass Care Services, Mass Search/Rescue, Natural and Cultural Resources, On-Scene Security/Protection, Operational Communication/Coordination, Planning, Public/Private Services, Health/Medical Service, Public Info/Warning, Risk Resilience Management, Risk Management Programs, Situational Assessment, Threat/Hazard Identification
<b>Resource Requirement</b>	
<b>Resources</b>	<b>Number Required</b>



**APPENDIX H: HAZARD IDENTIFICATION RISK ANALYSIS (HIRA) CONSEQUENCES**

**Wind**

<b>Wind</b>	
<b>Context Description</b>	A Category 3 Hurricane hits Volusia County from the Atlantic Ocean, affecting a large portion of the county with wind damage. An estimated 60% of the parcels within the 111-115 Wind Zone are affected, while 25% of the parcels within the 106-110 Wind Zone and 10% of the parcels within the 105-110 Wind Zone are affected.
<b>Core Capability</b>	
<b>Capability Target</b>	Community Resilience, Economic Recovery, Environmental Response, Health and Social Services, Housing, Infrastructure Systems, Long Term Vulnerability Reduction, Mass Care Services, Mass Search/Rescue, Natural and Cultural Resources, On-Scene Security/Protection, Operational Communication/ Coordination, Planning, Public/Private Services, Health/Medical Service, Public Info/Warning, Risk Resilience Management, Risk Management Programs, Situational Assessment, Threat/Hazard Identification
<b>Resource Requirement</b>	
<b>Resources</b>	<b>Number Required</b>









## APPENDIX I: FMP INTEGRATION INTO THE LMS ADOPTION RESOLUTIONS (COPIES)

This Appendix contains Volusia County's LMS Initiatives List as well as copies of signed adoption resolutions for the integration of the Volusia County Floodplain Management Plan into the Local Mitigation Strategy, June 2013.

**For additional information please refer to the 2013 Volusia County Integrated Floodplain Management Plan.**

# Volusia County Integrated Floodplain Management Plan

# 2013



Prepared for  
Volusia County Division of Emergency Management  
by  
The East Central Florida Regional Planning Council



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## **I. ACKNOWLEDGEMENTS**

The East Central Florida Regional Planning Council would like to thank the Floodplain Management Plan Committee for their participation in the preparation of this plan. The following jurisdictions were instrumental in the completion of this plan: Volusia County (and the LMS Steering Committee), Daytona Beach, Daytona Beach Shores, DeBary, DeLand, Deltona, Edgewater, Holly Hill, New Smyrna Beach, Oak Hill, Orange City, Ormond Beach, Pierson, Ponce Inlet, Port Orange, and South Daytona. Thank you to the Volusia County Division of Emergency Management for assisting in the plan development and coordination necessary for its success.

## **II. INTRODUCTION**

The National Flood Insurance Program (NFIP) provides federally supported flood insurance in communities that regulate development in floodplains. The Community Rating System (CRS) grades the various Community Floodplain Management Programs and reduces flood insurance premiums in those communities that meet certain requirements. In order to reduce the potential for personal/property losses in flood prone areas and ensure the lowest possible flood insurance premiums for our residents, Volusia County and the jurisdictions of Daytona Beach, Daytona Beach Shores, DeBary, DeLand, Deltona, Edgewater, Holly Hill, New Smyrna Beach, Oak Hill, Orange City, Ormond Beach, Pierson, Ponce Inlet, Port Orange and South Daytona have developed this Floodplain Management Plan which includes specific jurisdictional plans. The Plan was developed and is updated annually with input from the Volusia County Local Mitigation Strategy Steering Committee, Volusia Prepares; and the Volusia County Growth & Resource Management and Public Works Departments. On June 13, 2012, the Volusia Prepares Steering Committee voted unanimously to incorporate the Plan into the Volusia County portion of the Local Mitigation Strategy.

Activity section 510 of the CRS Coordinator's Manual requires an annual update of the Plan's implementation be made available to the local governing body (distributed electronically), the community, and the media. Copies of this plan are available for review at the Volusia County Kelly Administration Building, 123 West Indiana Avenue, DeLand, and the Daytona Beach Regional Library, 105 East Magnolia Avenue, Daytona Beach. Additionally, copies may be obtained by calling the Volusia County Emergency Management Division, 386-254-1500 or downloading a copy from <http://www.volusia.org/emergency/flood.htm>. A copy of this report has also been sent to the Daytona Beach News-Journal, the Orlando Sentinel, and the State of Florida NFIP Coordinating Official. This memorandum documents the current status of the Plan's implementation.

### III. BACKGROUND

This Floodplain Management Plan was developed by the East Central Florida Regional Planning Council for Volusia County and the jurisdictions within. The plan is designed to encompass a snapshot of floodplain hazards throughout the county and also provide separate jurisdictional plans developed as the appendices of the main plan. This design promotes a unified approach to mitigation and planning efforts and consistency across the county. As part of the planning process, this plan was integrated with the Volusia County Local Mitigation Strategy document (LMS). The LMS provides in-depth analysis of hazards and mitigation strategies. Various sections of the LMS have been identified throughout this Floodplain Management Plan in order to provide additional information for projects and analysis. The Volusia County Floodplain Management Plan follows the format and outline of the Community Rating System guidance. Individual jurisdictional analysis is provided in Appendix A of this document.

### IV. PLANNING PROCESS

#### A. Organize to Prepare the Plan

The 2013 Volusia County Floodplain Management Plan update was prepared by the East Central Florida Regional Planning Council (ECFRPC), a community planning office, in conjunction with the Volusia County Emergency Management Division, the Volusia County Growth Management Department and the jurisdictions within Volusia County. The ECFRPC project manager is a certified planner by the American Institute of Certified Planners. The planning committee consisted of Volusia Prepares LMS Working Group, County CRS Coordinator, Floodplain Managers, and additional jurisdictional staff responsible for the implementation of floodplain management strategies, State Mitigation Officers, Florida Department of Emergency Management and the State CRS coordinators. The planning process and committee were supported by the jurisdictional commissions, and the names of the planning team members are included below and Appendix E. These individuals were from departments ranging from Planning, GIS and Emergency Management. The resolutions passed in support of this plan are located in Appendix I. A listing of the team members from the city and county levels that were involved in this plan is listed below, along with the department that they are affiliated with:

- Daytona Beach (*Kimberly Dixon, Planning*)
- Daytona B. Shores (*Stewart Cruz, Planning*)
- Holly Hill (*Tom Harowski, Planning*)
- Lake Helen (*Don Findell, Administration*)
- Ormond Beach (*Becky Weedo, Planning*)
- Ponce Inlet (*Adrian Marks, Building*)
- DeBary (*Alan Williamson, Public Works*)
- Edgewater (*Tara Lynn Hilton, Planning*)
- Port Orange (*Michael Anderson, Engineering*)
- Volusia County (*Larry LaHue, Pat White, Emergency Management*)

Several planning committee meetings were held throughout the process. Due to the limited time frame to prepare the planning document, meetings focused on multiple steps of the process. Table 1 lists the planning team meeting dates and focus areas.

**Table 1: Planning Committee Meetings**

Meeting	Date	Location	Focus Areas
Kick Off Meeting for Planning Team	12-Dec-12	Volusia County Beach Headquarters, Daytona Beach	Plan and CRS Overview, Planning Process, Planning Team, Public Outreach, Resolutions, Goals
Planning Meeting #2	31-Jan-13	Volusia County Emergency Management Offices	Plan Status, Hazard Assessment, Public Outreach, Mitigation Strategies and Action Plan
Planning Meeting #3	8-April-13	Volusia County Emergency Management Offices	Public Outreach, Problem and Hazard Assessment Review, Action Plan, Plan Evaluation and Revisions
Final Planning Meeting	13-April-13	Volusia County Emergency Management Conference Call	Action Plan Review, Final Plan Comments, Adoption Resolutions

**B. Involve the Public**

As part of the planning process, numerous efforts to engage the public were implemented. The planning committee reviewed the survey and provided comments prior to public release. A public survey was created using surveymonkey.com and the link was provided to all jurisdictions for release in newsletters, utility/water bills, and through websites and social media. The link was also made available on the Volusia County Floodplain website. The survey was also made accessible at the public meetings held in February, as a computer was provided for those members of the public who had not yet completed the survey. The survey announcements provided contact information in order to request a hard copy of the survey, which was then provided with a return envelope. One jurisdiction provided addresses of numerous religious facilities within the jurisdiction. Postcards were addressed to these facilities which provided information and the survey link. The public survey received a total of 220 responses during its collection period from January 2, 2013 to March 10, 2013. During the survey collection period, 17 physical copies of the survey were requested and mailed to the residents. Of these requests, 13 surveys were completed and returned, resulting in a 76% response rate.

Key findings from the survey are as follows:

- Over 55% of respondents have lived in their current residence for over 11 years.
- Approximately 65% of respondents indicated their home was built prior to 1987.
- 43.2% responded that they are not concerned about the possibility of their home flooding, 38.6% are somewhat concerned, and 18.2% are very concerned about the possibility of their home being flooded.
- 24.5% of respondents noted that their home is located within a floodplain, 37.3% are located outside a floodplain, and 38.2% (the majority) are unsure if their home is located within a designated floodplain.
- Of the 24.5% of respondents knowing within the floodplain, 15.7% are in Zone AE, 13.7% are in Zone A, 9.8% are in Zone A1-A30. However 60.8% are unsure of their zone classification.
- Nearly 78% of respondents indicated that their home, to their knowledge, has never flooded due to natural causes.
  - Of the 12.4% of respondents indicating their home had flooded due to natural causes, 88.9% noted that the last flooding occurred between 2000 and 2009 (this would include the 2004 Hurricanes and TS Fay).
  - 70.4% of those respondents who have experienced flooding in their homes noted that the flooding was less than 1 foot in depth, 22% experienced between 1 and 2 feet of water.
  - The cost of structural damages associated with this flooding was varied; 25% noted less than \$1000; 22% noted between \$5000 and \$10,000; and 26% indicated structural damages between \$10,000 and \$50,000.
  - The approximate dollar value of personal items lost was varied as well; 33.3% noted less than \$1000 in loss; 22.2% indicated between \$1,000 and \$1,999; and 14.8% lost more than \$5,000 of personal items (18.5% were unsure).
- 42% of total respondents have flood insurance.
- Of the 51% without flood insurance, the majority (40%) stated that the main reason for not having flood insurance was that they feel there is no real threat of a flood on their property; 33% indicated that cost is the main reason.
- Nearly 16% of respondents noted that flood mitigation efforts had been implemented on their property. 31% were unsure.
  - Mitigation included a variety of efforts from pouring a cement barrier at wall bases, building a flood wall, elevating house slab, control ditches, building swales, fill dirt, elevated property and home, sold property adjacent to home for retention pond, and natural vegetation to act as flood barrier.
- 81% of respondents indicated that they have never considered implementing flood management strategies on their property. The reasons for the lack of implementation include time and money.

- Only 3 respondents (1.3%) indicated that their property is currently classified as a repetitive flood loss property. 12.4% are unsure.
- 25.7% of respondents have visited the Volusia County Floodplain website.
- 13.4% of respondents are very satisfied with jurisdictional efforts of public involvement and outreach as it concerns flood hazards; 21.8% are somewhat satisfied; 8.4% are somewhat dissatisfied; 8.4% are very dissatisfied, and 48% are unaware of public involvement/outreach efforts.

Appendix B provides documentation of the various efforts used to inform the public of the survey, copy of the public survey, and the final results.

The business community was engaged in the process through a survey created specifically for business owners. The link to this survey was made available to jurisdictions to release to the various Chambers of Commerce and other business oriented agencies and groups within their community. The link was also distributed through various websites. This survey was also made available at the public meetings for any business owners in attendance. This survey received 22 responses during its collection period from February 7, 2013 – March 15, 2013. Appendix C provides a copy of the business survey.

Main findings from the business survey are as follows:

- The majority of respondents (38%) have been in business at their current locations for 11- 20 years.
- 45% of buildings were constructed between 1987 and 2001.
- 70% of respondents are not concerned about their business flooding and 63% are not concerned about the flooding possibility of streets accessing their business.
- While 25% of respondents indicated they are located within a designated flood hazard zone, 35% are unsure. Of these respondents, 50% noted that they are unsure of their flood zone.
- Being located in a flood zone was a concern in business location for 25% of respondents.
- 26% of respondents indicated that their place of business has flooded due to natural/environmental causes; 60% of these respondents noted the flooding event occurred between 2000 and 2009 while 40% occurred between 2010 and 2012.
- Flooding has caused 93% of respondents to close their business for 0-1 days and 6.7% to close between 2-4 days.

- 25% of respondents have flood insurance for their property while 25% are unsure and 50% do not have flood insurance.
- When asked why they do not have flood insurance, 55% of respondents without flood insurance indicated that they feel there is no real threat of flooding on their property while 22% noted that they rent their property.
- Approximately 19% of respondents noted that flood mitigation efforts have been implemented on their property.
- 87% of business respondents are satisfied with public involvement and outreach efforts by local jurisdictions as related to floodplain management.

In Volusia County, a number of Home Owner Associations are associated with developments within the 100 year floodplain. An analysis of the floodplain and home owner association data identified 94 associations within the floodplain. Another specialized survey was developed and due to the availability of only mailing addresses, postcards were sent to the 94 home owners association with information and the link to the survey. This survey was open for comment from February 19 – March 15, 2013. During this time, 4 surveys were completed, resulting in a 5% response rate. A total of 19 announcements were returned to sender. Due to the low response rate, survey responses were not analyzed. However, a copy of the survey and the notification postcard is found in Appendix D.

A total of 3 public meetings were held during the planning process. Two meetings were held to kick off the plan process and obtain initial comments and input from the public. All public meetings were advertised in the Florida Administrative Weekly and a press release was issued to all jurisdictions and the Volusia County Public Information Officer. Appendix E provides samples of the public meeting announcements conducted throughout the county and within jurisdictions.

Due to the size of Volusia County, it was determined the best way to reach the residents was to hold one meeting on the east side of the county (Daytona Beach Library) and one on the west side (Volusia County Historic Courthouse in DeLand). The meetings were held on February 11 and February 15, 2013. The meetings consisted of a presentation on the plan background and purpose, question and answer session and an open house session. Computers were provided at the meeting for attendees to access the public survey and to visit the Volusia County Flood Mapping website to determine whether a specific property is located within the floodplain. Public comments were recorded and brought back to the planning team for discussion and review.

A final public meeting was held on April 8, 2013 during the public final comment period. This meeting was held to provide the public with an open forum to address comments, concerns and suggestions concerning the floodplain management plan. The meeting consisted of a presentation which provided an overview of the planning process, public comments from the surveys and meetings, outline of the plan, and an overview of hazards and strategies. A question and answer session occurred and the remainder of the meeting time was formatted as an open house. Public comments were recorded and brought back to the planning team for discussion and review.

The public was also provided the opportunity to comment on the final draft plan through an open survey period. Emails with the plan and survey links were provided to property, business and homeowners who supplied contact information in the initial surveys. A press release was provided to media outlets and all jurisdictions and partnering agencies and stakeholders were provided the link to the survey and document for dissemination to the public and for use on social media outlets. The public comment period was open from April 3 – April 12, 2013. Attempts to encourage public input to the planner or Floodplain Management Plan Committee included information distributed through Utility Bills and informational notices posted on webpages. Local television, Channel 13, aired a news segment about the FMP Public Survey. Additionally, the County has built a web site and links to provide flood and other natural hazard related information.

### **C. Coordinate**

Existing studies, reports, plans and other information were reviewed in the development of this plan. These documents include the Volusia County Local Mitigation Strategy, local Comprehensive Plans, Land Development Codes, Ordinances, and stormwater management plans. During the LMS update of 2010, individual plan updates were reviewed as well to ensure consistency and overlapping projects and priorities. Table 2 illustrates the plans, reports, codes, and other documents within each jurisdiction. *The Volusia County LMS provides more information concerning each plan and its role in emergency management and floodplain management. This information can be found in Section 7: Capability Assessment of the LMS.* Note that as part of the Floodplain Management Plan, this table has been updated and modified from the LMS. It is recommended that during the next update of the LMS, this table be used as a point of update. Note: All jurisdictions, through this FMP have an integrated a standalone Floodplain Management Plan.

Jurisdiction	Local Mitigation Strategy	Comprehensive Land Use Plan	Floodplain Management Plan*	Open Space Management Plan	Stormwater Management Plan	Natural Resource Protection Plan/Policies/Code	Flood Response Plan	Emergency Operations Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Plan	Historic Preservation Plan	Floodplain Ordinance (or Flood Damage Prevention Ordinance)	Zoning Ordinance	Subdivision Ordinance	Land Development Code	Post-disaster Redevelopment /Reconstruction Ordinance /Policy	Building Code	Building Code with FEMA Floodplain Standards (2013)	Fire Code	National Flood Insurance Program	NFIP Community Rating System
Daytona Beach	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X		X		X	X	X	
Daytona Beach Shores	X	X			X			X		X		X			X	X		X		X	X	X	X	
DeBary	X	X	X	X	X	X	X	X			X	X	X		X	X	X			X		X	X	
Deland	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X		X		X	X	
Deltona	X	X	X	X	X	X		X	X	X		X	X			X	X	X		X		X	X	X
Edgewater	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X
Holly Hill	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X			X		X	X	X
Lake Helen	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X		X		X	X	
New Smyrna Beach	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oak Hill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Orange City	X	X	X	X	X		X	X	X	X		X		X		X	X			X	X	X	X	
Ormond Beach	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pierson	X	X						X		X		X				X	X			X		X	X	
Ponce Inlet	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X
Port Orange	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
South Daytona	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X			X		X	X	X
Volusia County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X

**Table 2: Jurisdictional Plans**

Source: Volusia County LMS, 2010 and updated

The Planning Team reviewed plans from the County and all jurisdictions for information geared to assist in the data collection, analysis and overall development of this plan. While the Local Mitigation Strategy provided a great deal of information, individual Comprehensive Plans gave the planning team good insight into the policy-driven needs of these jurisdiction from a community resiliency and land use perspective. The datasets compiled from the Future Land Use element of each Comprehensive Plan within the County (city and county) were utilized to create a land-use based GIS analysis in the risk assessment portion of this report. The county Emergency Operations Plan and COOP Plans were also reviewed by the Planning team to ensure the initiative and analyses included in this plan reflect the actual response mechanisms already in place in Volusia County. Of the plans listed above, another crucial piece of information from the jurisdictional level came from building codes and standards located within Land Development Codes.

Figure 1: 2011 DFIRM - Volusia County 100-Year Floodplain

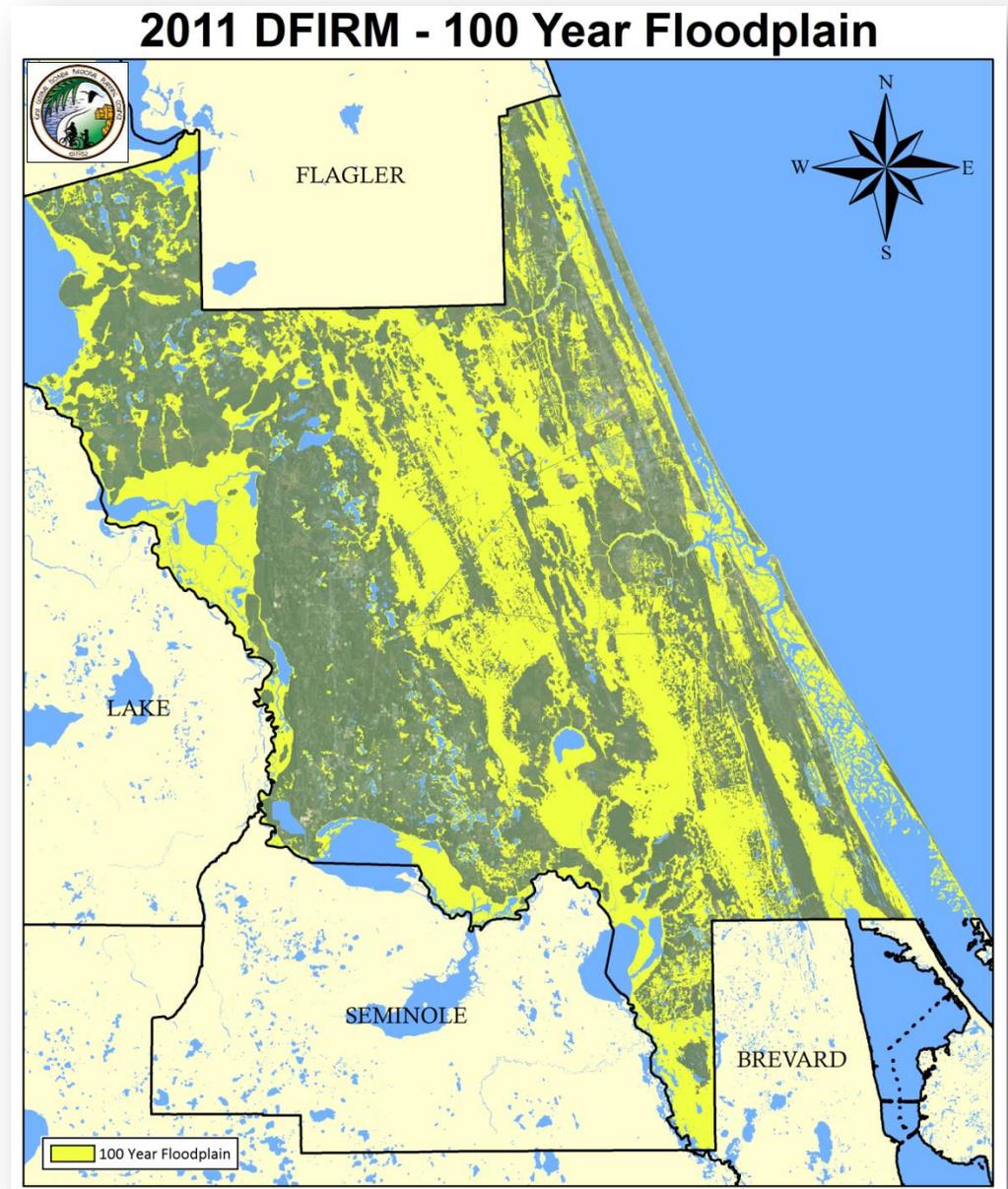
## V. RISK ASSESSMENT

### A. Assessing the Hazard

The County consists of approximately 1,210 square miles with 50 miles of Atlantic coastline. Approximately 982 square miles are located in unincorporated Volusia County. On the east side of the County, the Halifax River and the Indian River North/Mosquito Lagoon make up the Intracoastal Waterway and form long, narrow estuaries which separate the mainland from the barrier island. Ponce DeLeon Inlet, located near the middle of the coastline, serves as the County's only passage through which ocean tides and hurricane surges propagate into the Intracoastal Waterway.

The St. Johns River is the largest river in the County and flows along the west side of the County. The Tomoka River has a tributary area of 159 square miles, which serves the northeastern and central portions of the County. The river flows from south to north and discharges through the Tomoka Basin to the Halifax River, which can be subject to storm surge.

Volusia County's primary and most often occurring hazard is from flooding caused by hurricanes, tropical

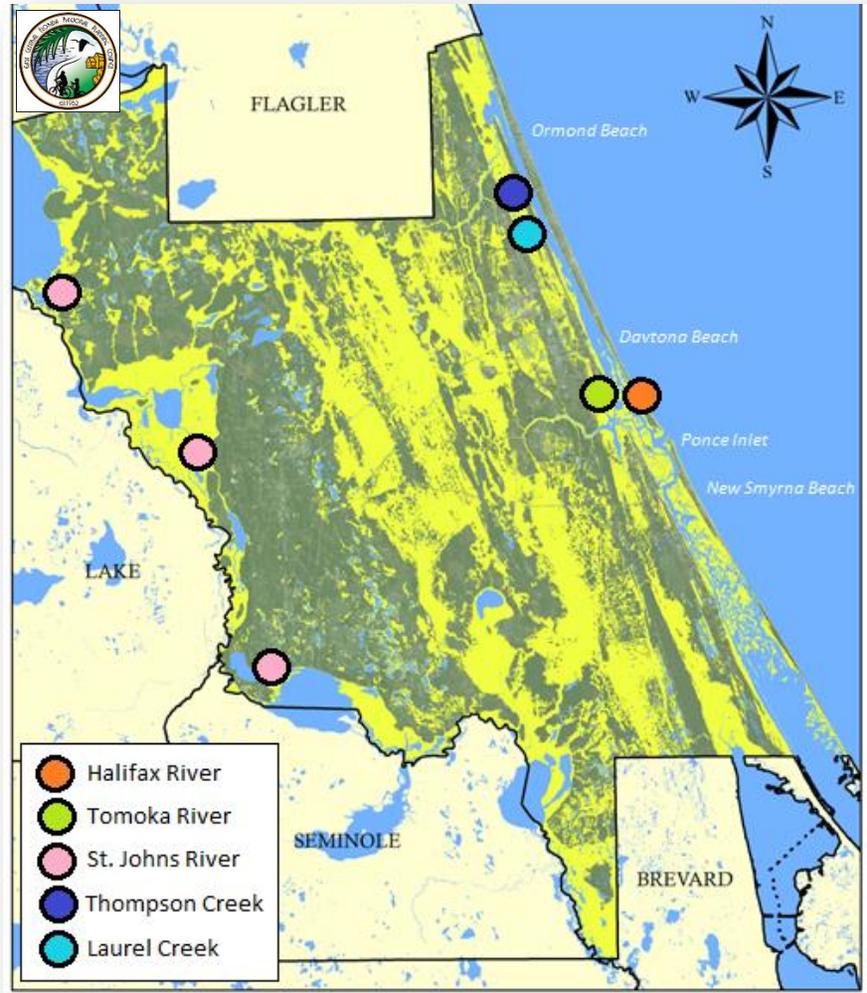


Sources: FEMA, Volusia County GIS 2013

storms, and subtropical events that are associated with extremely heavy rain. Many areas of Volusia County are susceptible to riverine and urban flooding as well as by storm surge due to coastal storm events. Riverine flooding occurs from the St. Johns River, the Halifax River and the Tomoka River, in addition to associated tributaries and creeks such as Thompson Creek and Laurel Creek in the City of Ormond Beach area. Additionally, certain low-lying inland areas in the northwest, north, southeast and southwest are considered flood-prone areas. Many evacuation routes traverse the floodplain and if not mitigated properly (elevated, designed, etc.), could be prone to flooding. Figure 1 (on the last page) depicts the Volusia County 2011 DFIRM flood zones throughout the County. Figure 2B is taken from the Statewide Regional Evacuation Study for the East Central Florida Region and depicts storm surge zones in Volusia County by hurricane category.

Areas vulnerable to flooding are generally located within the floodplain. FEMA updated the Flood Insurance Rate Maps for Volusia County and published them in 2011. While the preliminary DFIRMS are not currently in effect at the time of completion of this plan, this data was used as the “Best Available Data”. Base flood elevations have been calculated in the Flood Insurance Study for Volusia County.

**Figure 2A: Riverine and Urban Flooding**

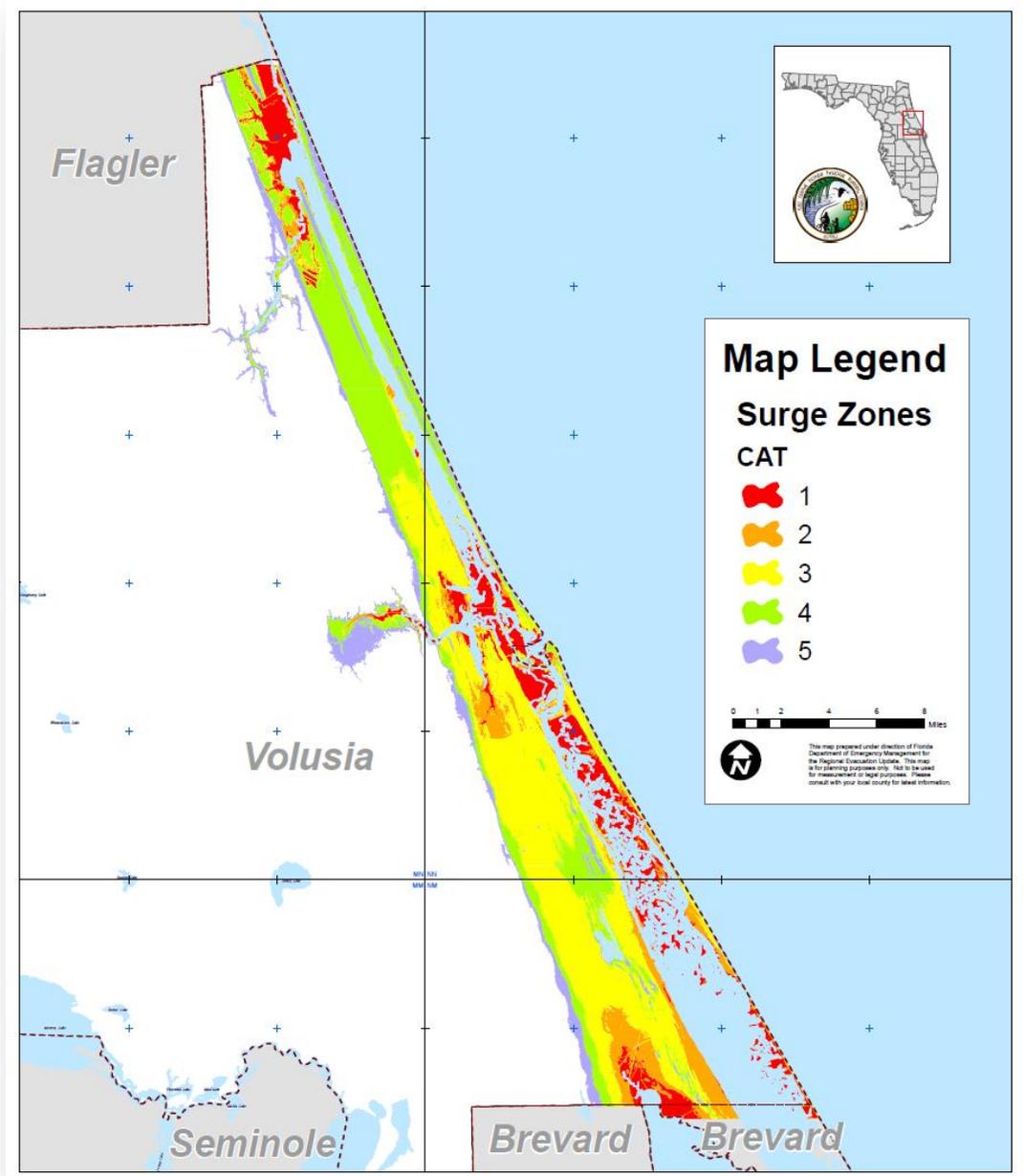


Sources: FEMA, Volusia County DEM and Jurisdictions, 2013

**Figure 2B: Storm Surge by Hurricane Category**

Coastal flooding caused by tropical storms, hurricanes and unusually high tides combined with strong easterly or northeasterly winds also poses a continuing threat to the County. Storm surge produces most of the flood damage and loss of life associated with storms that make landfall or that closely approach a coastline. Of the hurricane hazards, the storm surge is considered to be the most dangerous since nine out of ten hurricane related deaths are attributed to drowning.

The principal tool utilized in assessing the hazard of storm surge is the Sea, Lake and Overland Surges from Hurricane (SLOSH) model. The computerized SLOSH model predicts the tidal surge heights that result from hypothetical hurricanes with selected various combinations of pressure, size, forward speed, track and winds. The SLOSH model, which is utilized locally for hazard and vulnerability analysis, has been digitized into the County’s GIS (Geographical Information System) mapping system. Estimated storm surge heights range from two to four feet in a Category 1 storm to in excess of twenty feet in a Category 5 storm. Table 2B is from the 2010 Statewide Regional Evacuation Study Program



Source: Statewide Regional Evacuation Study, 2010

developed for the east central Florida region by the ECFRPC. Through SLOSH Analysis, it was determined that a Category 1 storm surge will produce storm tide heights up to 6 feet. A category 5 storm will produce storm tide heights up to 25 feet. It should be noted again that these surge heights represent the maximum surge height recorded in the county from the storm tide analysis including inland and back-bay areas where the surge can be magnified dependent upon storm parameters.

The last major storm surge occurred from the 2004 storms: Hurricanes Charley, Frances, and Jeanne. Although no official flooding depth measurements were taken during the 2004 events, it has been estimated that storm surge flooding during the storms caused tidal waters to rise three to five feet above the mean high tide. During Hurricane Frances, over 13 inches of rain fell in the County causing substantial flooding. Over \$390 million worth of damages resulted from wind and flooding impacts. The most recent significant freshwater flooding was a result of the “No-Name” rain event of May 2009 which impacted numerous homes on the east side of the County. This event left some properties in the affected areas two feet under water. In 2008, Tropical Storm Fay caused severe flooding on the west side of the County. Rainfall ranged from 3 inches to over 10 inches along the east coast of Florida. Volusia County reported damages in excess of \$13.5 million.

Since 1965, Volusia County has received numerous disaster declarations for such hazards as hurricanes, tornados, floods and severe freezes. Since 1993, there have been 12 reported flood events in Volusia County. Table 4 (on the next page) is a list of the severe storm and flooding activation events for the Volusia County Emergency Operations Center. These events include those Presidential Disaster Declarations.

As stated above, riverine and storm-surge induced flooding events can and do occur outside of the 100-year floodplain. Areas where levees and dams are present are also at an increased risk for flooding events, as are areas along the coastline that are within coastal erosion zones. Finally, long term sources of risk such as sea level rise and tsunamis must be included as “lower probability” threats to areas that are not within the floodplain. The last known tsunami-type event occurred in Daytona Beach on July 3, 1992, injuring over 70 individuals. Solutions to these issues can include infrastructure mitigation, shoreline protection and resilient community planning techniques (including developing in areas that are not prone to flooding and can accommodate future populations).

**Table 3: Potential Storm Tide Height(s) (In Feet above NAVD88)**

*Storm Strength	Volusia
Category 1	Up to 6'
Category 2	Up to 10'
Category 3	Up to 14'
Category 4	Up to 23'
Category 5	Up to 25'

*Source: Statewide Regional Evacuation Study, 2010*

**Table 4: Disaster Declarations resulting in Flooding in Volusia County**

Date of Event	Type of Event	Area of Event	Damage Estimate	Damage Estimates
			# of Parcels	Dollars
11/17/1994	T.S. Gordon	County-wide	658	\$10,602,924.00
8/3/1995	Hurricane Erin	Edgewater	31	\$65,052.00
7/10/1996	Hurricane Bertha	County-wide	NA	NA
9/5/1996	Hurricane Fran	County-wide	NA	NA
10/8/1996	T.S. Josephine	County-wide	193	\$1,232,343.00
9/14/1999	Hurricane Floyd	East Side	433	\$18,655,353.00
10/16/1999	Hurricane Irene	East Side	185	\$16,809,266.00
9/16/2000	Hurricane Gordon	County-wide	NA	NA
9/14/2001	T.S. Gabrielle	County-wide	44	\$474,135.00
11/15/2001	Rain Event	East Volusia	39	\$561,300.00
9/4/2002	T.S. Edouard	County-wide	NA	NA
8/13/2004	Hurricane Charley	County-wide	5719	\$106,900,000.00
9/4/2004	Hurricane Frances	County-wide	26964	\$393,900,000.00
9/25/2004	Hurricane Jeanne	County-wide	UNK	\$59,500,000.00
9/8/2005	T.S. Ophelia	County-wide	Beach	NA
10/23/2005	Hurricane Wilma	County-wide	3	\$752,000.00
8/29/2006	T.S. Ernesto	County-wide	NA	NA
8/18/2008	T.S. Fay	County-wide	240	\$13,580,016.00
5/17/2009	May Rain Storm	County-wide	1654	\$69,516,703.00

### Known Flooding Areas (Countywide)

Figure 3 depicts areas that have been identified by county stakeholders as areas prone to flood damage.

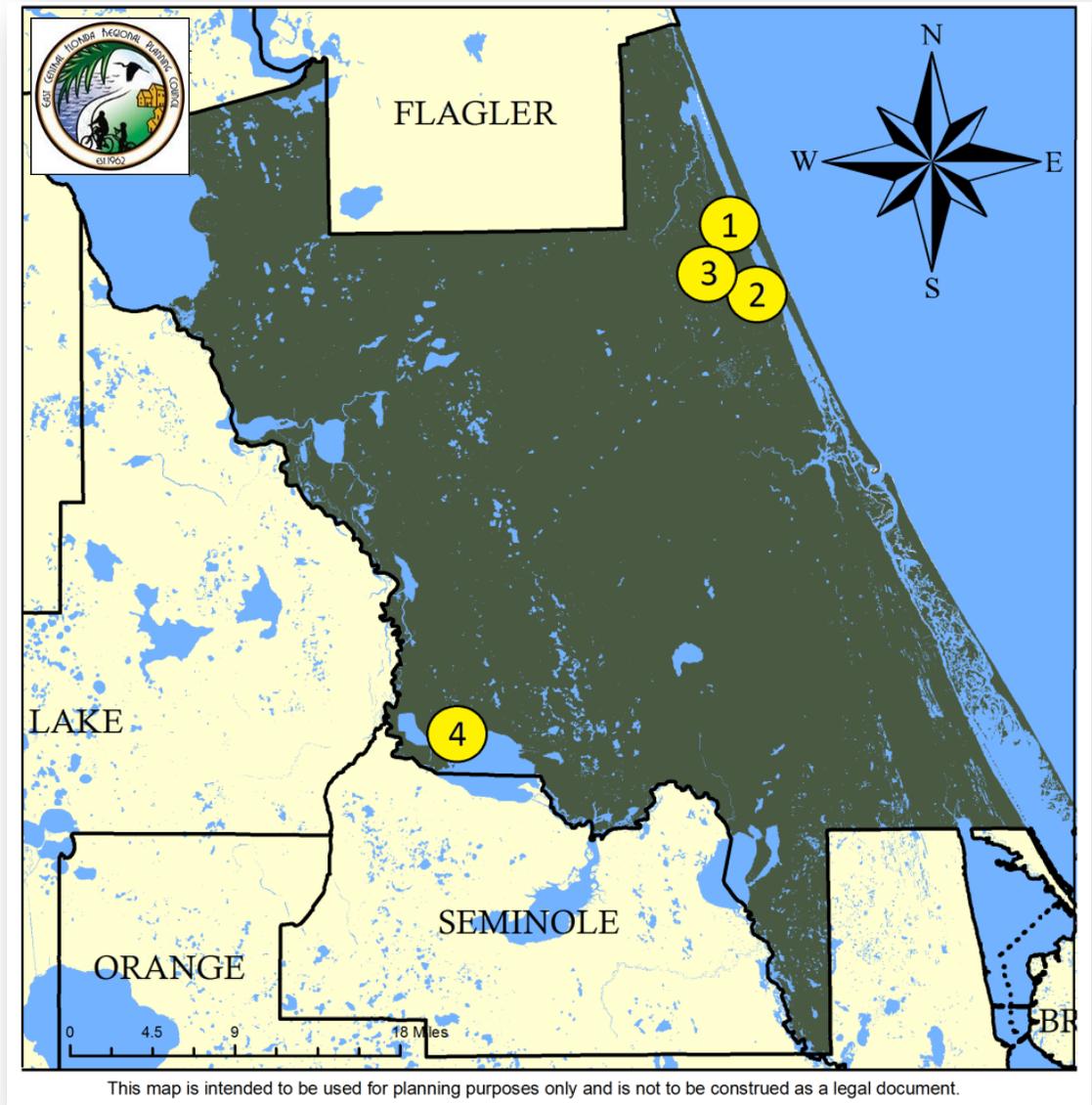
1. **SICA HALL CANAL** – Canal prone to flooding.
2. **LPGA CANAL** – Canal prone to flooding.
3. **NOVA CANAL** – Canal prone to flooding.
4. **STONE ISLAND** – Residential area prone to flooding.

### B. Assessing the Problem

#### 1. VULNERABILITY SUMMARY

Table 5 depicts the Hazard Risk Score for each jurisdiction as it concerns flooding and storm surge as per the Local Mitigation Strategy. Each hazard was scored by the jurisdictions based on a number of vulnerability factors including area impacted, health and safety of the population, property, environment, and economic vulnerability. Each hazard was given a score between one and five with

Figure 3: Known Flooding Areas in Volusia County



Sources: Volusia County DEM and Jurisdictions, 2013

five being the greatest. This number was then multiplied by the score of the hazards probability of occurrence (1-5) resulting in a risk rating for each jurisdiction. Additional hazard information can be found in the Volusia County Multi-Jurisdictional Local Mitigation Strategy (LMS), Section 5 – Hazard Profiles. Specific information for Hurricane and Tropical Storms can be found in Section 5.3; Flood can be found in Section 5.10; and Storm Surge can be found in Section 5.11. Section 7.3.4 Floodplain Management describes the Volusia County NFIP actions and the Community Rating System.

The Flood Hazard analysis includes location and spatial extent of the hazard, historical occurrences and impacts, historical summary of insured flood losses, analysis of loss properties and probability of future occurrences.

In order to update the Volusia County Multi-Jurisdictional Local Mitigation Strategy of 2010, a Vulnerability Assessment was updated using HAZUS and MEMPHIS data, as well as the most recent local parcel data for GIS analysis. Hazard maps, hazards exposure and loss estimates were also included. (See Sections 4, 5 and 6 of the LMS for further information.) In addition, each jurisdiction reviewed the hazards scores that were included in the 2005 LMS (Comparison of Jurisdictional Relative Risk) and modified the scores for each hazard to reflect changes in the impacted area; probability of occurrence; and affects to the built and natural environment and economy.

As per the 2010 Volusia County FMP, Volusia County’s probability of flood occurrences is rated as “high” (expected to occur at least every 5 years). While all jurisdictions in Volusia County participate in NFIP, only 10 jurisdictions currently participate in the Community Rating System (CRS): (Daytona Beach, Daytona Beach Shores, Deltona, Edgewater, Holly Hill, New Smyrna Beach, Ponce Inlet, Port Orange, South Daytona, and Volusia County).

## 2. LIFE, SAFETY AND HEALTH

Freshwater flooding along rivers and streams causes significant property damage and has the potential of causing personal injury and deaths. Over the past 20 years, freshwater flooding had become the leading cause of death related to hurricanes. This is due in part to the successful evacuation planning efforts in the United States which had significantly reduced the number of deaths (in the U.S.) related to storm surge until 2005. However, it is also recognized that many coastal and inland residents do not recognize the risk associated with freshwater flooding, especially when driving.

In response, a national program, “Turn Around, Don’t Drown” was implemented in 2002. Typically, the rainfall associated with, and in advance of, a hurricane does not in itself necessitate the emergency evacuation of residents during the passage of a hurricane. Days after a storm however, the coastal flooding and rainfall – particularly from slow moving storms - may cause the evacuation of inland residents as swollen rivers and streams breach their bank or levees. Rainfall may cause the inundation of roadways sought as evacuation routes. In addition, given Florida’s climatology and the normal summer weather, flooding may occur as a disassociated event prior to the hurricane, flooding evacuation routes and saturating the ground. Contingency plans including rerouting, sandbagging and pumping will be coordinated with local and state law enforcement and the State Department of Transportation. Rainwater inundation of evacuation routes must be addressed in an evacuation plan. The planning strategy to address this problem is to plan for the passage of all vehicles over such roadways before substantial rainfall from the hurricane is expected.

The Central Florida region is among the fastest growing regions in the world with 10-year population growth figures exceeding 20%. Volusia County is located within the northeastern quadrant of this region and has seen a vast increase in population since the late 1970’s. From a safety and health perspective, the locations of new populations migrating to Volusia County over the next few decades would benefit if located away from floodplains. Two strategies to counter human exposure to floodplains include urban infill and increased density near existing transit nodes.

### Populations of Cities within Volusia County (2010 Census)

Daytona Beach: 61,005	New Smyrna Beach: 22,481
Daytona Beach Shores: 4,247	Oak Hill: 1,792
DeBary: 19,320	Orange City: 10,599
DeLand: 85,219	Ormond Beach: 38,137
Deltona: 11,659	Pierson: 1,736
Edgewater: 20,750	Ponce Inlet: 3,032
Holly Hill: 11,659	Port Orange: 56,048
Lake Helen: 2,624	South Daytona: 12,252

### 3. CRITICAL FACILITIES

Flooding can have impacts on critical facilities and the ability to respond to emergencies. According to the Florida Division of Emergency Management, "Critical facilities" are defined as those structures from which essential services and functions for victim survival, continuation of public safety actions, and disaster recovery are performed or provided. Shelters, emergency operation centers, public health, public drinking water, sewer and wastewater facilities are examples of critical facilities. Though not explicitly included in the definition, supporting life-line infrastructure essential to the mission of critical facilities must also be included in the inventory when appropriate. All but one jurisdiction in Volusia County has a critical facility within the 100-Year Floodplain. Although several western jurisdictions are low in elevation, a disproportionately high number of critical facilities that are exposed to the floodplain are within a short distance to the Atlantic Ocean or inter-coastal waterway on the east side of the county. Approximately two-thirds of the exposed critical facilities countywide are located east of Interstate-95.

The inundation of critical facilities can have a profound effect on the ability for coordination among county and city planning officials and mitigation activities must provide guidance to avoid 'domino effect' losses from a critical infrastructure perspective. For example, if a critical facility such as the Volusia County EOC is completely destroyed in a disaster, there are a number of other communication and logistical critical facilities that utilize the EOC as a 'home base' for their own activities. In these cases, strategies must be put in place to ensure that backup facilities can manage the loss of core critical infrastructure loss. The East Central Florida Regional Planning Council and Volusia County Emergency Management recently completed a Continuity of Operations Plan for the loss of the Volusia County EOC, while other plans focused on other facilities can strengthen cooperative efforts in the future.

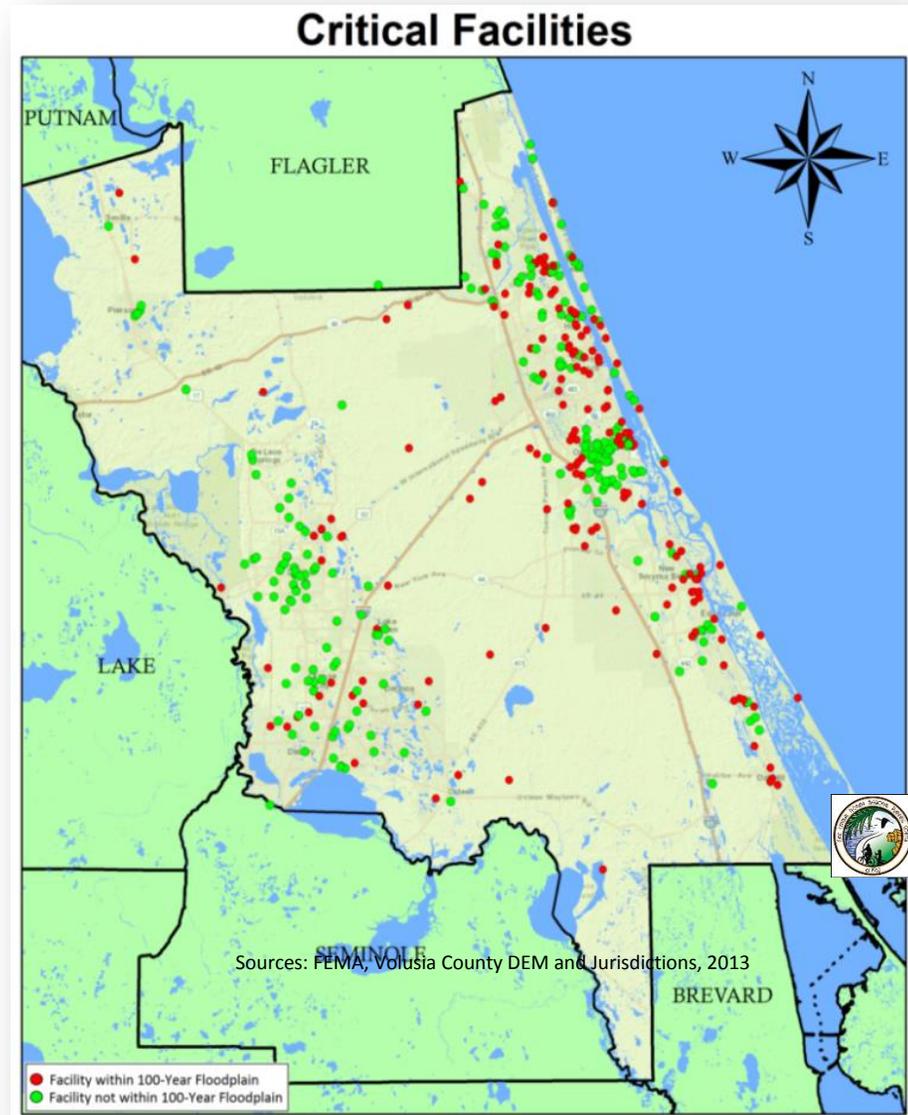
Specific areas of concern from a critical infrastructure and facility perspective include communication towers, water management infrastructure, facilities that double as storm shelters (including schools) and core-logistical facilities (EOC, etc.).

Table 5 outlines the number of critical facilities exposed to the floodplain, by jurisdiction. Please reference **Appendix A** at the end of this document to view a more detailed listing of exposed critical facilities by jurisdiction.

Figure 4: Critical Facilities in Volusia County

Table 5: Number of Critical Facilities in the Floodplain per Jurisdiction

Municipality	# Crit. Facilities in FP
Daytona Beach	23
Daytona Beach Shores	3
DeBary	3
DeLand	9
Deltona	8
Edgewater	3
Holly Hill	9
Lake Helen	1
New Smyrna Beach	14
Oak Hill	4
Orange City	3
Ormond Beach	26
Pierson	0
Ponce Inlet	3
Port Orange	34
South Daytona	2
Unincorporated	31
<b>Countywide</b>	<b>176</b>



#### 4. ECONOMIC ANALYSIS

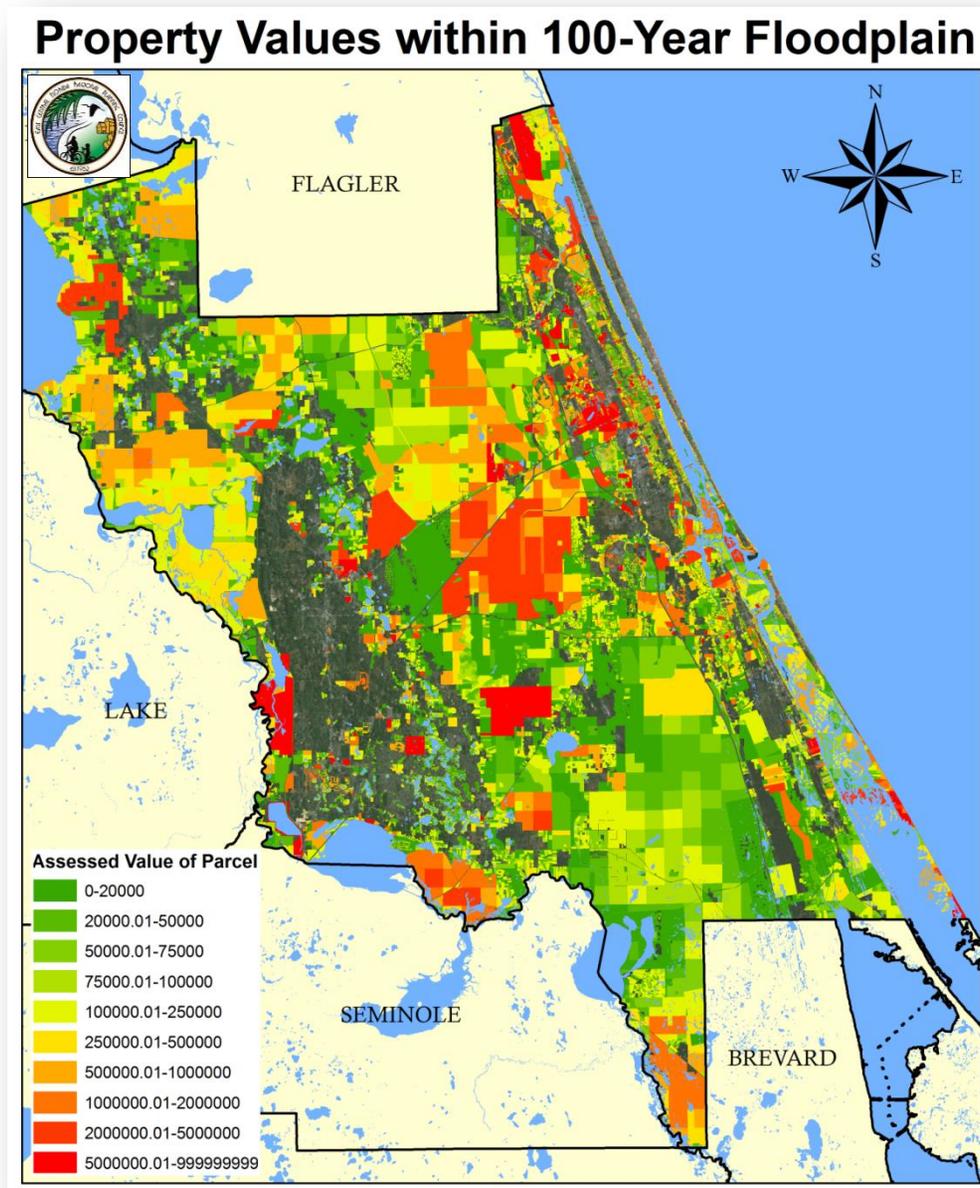
Analysis of the financial values of all parcels exposed to the 100-Year Floodplain in Volusia County revealed that approximately 9 billion dollars in property value is located (partially or completely) within the 100-Year Floodplain. Of these parcels, 46.39% were considered “low value” parcels (valued under \$50,000) while only 1.22% of parcels were valued over one million dollars.

The VE floodplain zone, a specific portion of the 100-year floodplain, is located along the coastal area and includes properties that are subject to flooding from velocity occurrences such as wave action. The following data summarizes the exposure within this zone.

- **Land Value:** \$389,833,236 (*\$104,422,460 vacant*)
  - 50% built before 1980 (worth \$201,902,070)
- **Assessed Value:** \$554,312,204 (*143,035,736 vacant*)
  - 50% built prior to 1980 (worth \$274,074,815)
- **Taxable Value:** \$513,378,102 (*125,008,722 vacant*)
  - 50% built prior to 1980 (worth \$266,678,098)

While the VE zone is located near coastal areas, much of the 100-year floodplain is located within inland portions of the county. Please reference the table on the following page to view cumulative financial exposure to the entire 100-year floodplain (all zones), by jurisdiction.

Figure 5: Assessed Value of Properties Located within the 100-Year Floodplain in Volusia County



Sources: FEMA, Volusia County GIS and Jurisdictions, 2013

**Table 6: Total Financial Exposure to 100-Year Floodplain**

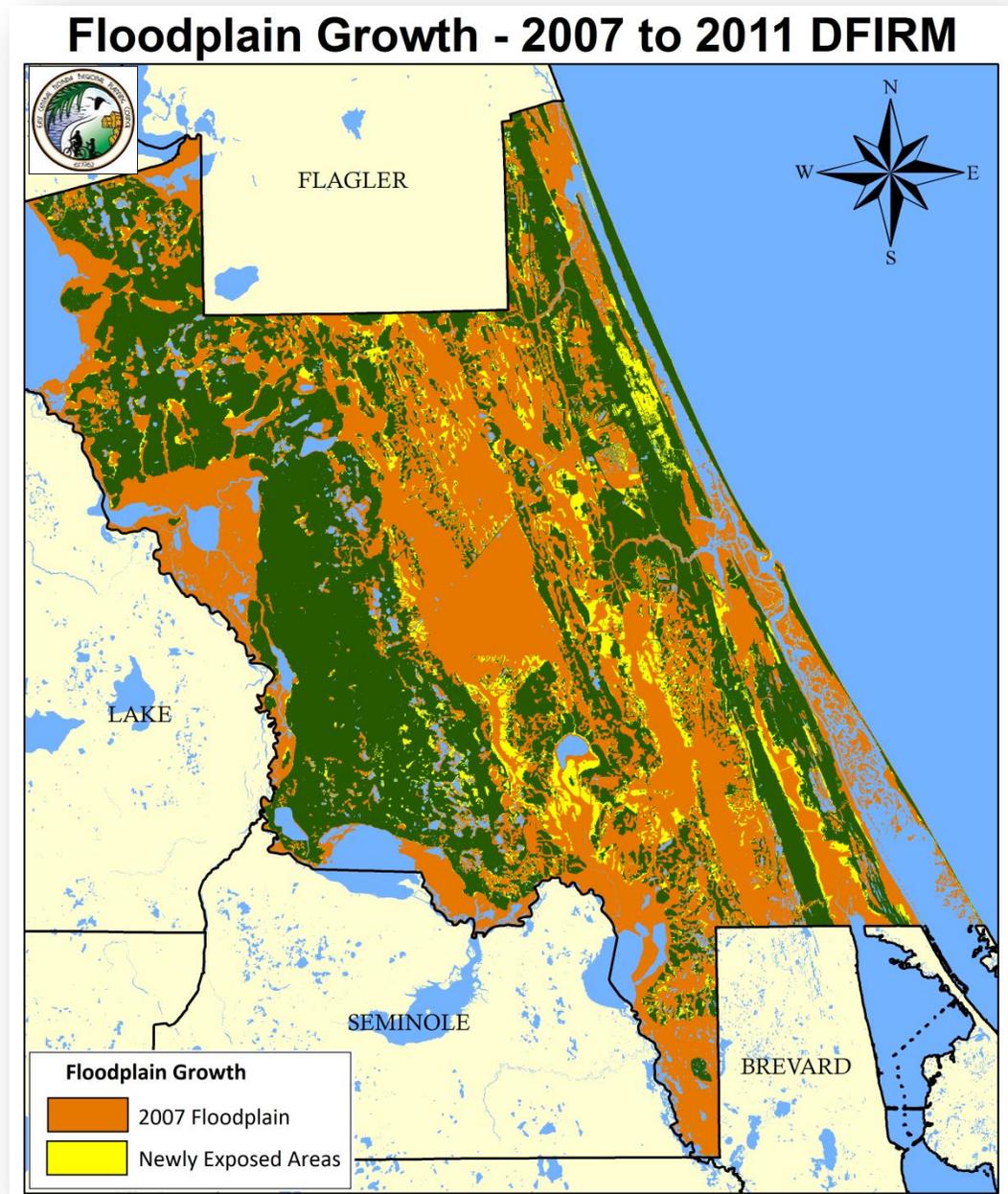
Municipality	Land Value	Property Value	Taxable Value	Tax Base Exposure	% Valued > \$1M	% Valued 50K-1M	% Valued < 50K
Daytona Beach	\$794,719,997	\$2,009,330,307	\$1,306,286,647	\$32,655,076	2.97	54.78	42.35
Daytona Beach Shores	\$87,978,797	\$133,736,380	\$129,317,945	\$3,355,645	13.55	57.48	28.97
DeBary	\$79,180,679	\$169,939,656	\$143,484,583	\$2,953,314	0.92	70.23	28.85
DeLand	\$39,736,180	\$94,713,480	\$49,583,914	\$1,217,300	9.76	65.37	24.88
Deltona	\$127,916,206	\$433,277,839	\$291,195,134	\$7,539,712	0.14	66.80	33.06
Edgewater	\$108,075,088	\$159,482,952	\$128,656,191	\$3,260,238	0.70	68.21	31.09
Holly Hill	\$90,329,062	\$250,707,196	\$191,851,481	\$4,644,494	0.86	58.83	40.31
Lake Helen	\$13,518,929	\$25,849,726	\$19,305,611	\$525,331	0.69	47.42	51.89
New Smyrna Beach	\$505,308,724	\$1,015,362,846	\$842,345,780	\$19,299,321	1.24	78.56	20.20
Oak Hill	\$53,241,155	\$78,420,568	\$52,758,547	\$1,521,266	0.65	61.85	37.50
Orange City	\$24,947,089	\$84,362,909	\$51,921,162	\$1,280,817	12.68	54.93	32.39
Ormond Beach	\$463,251,795	\$959,923,055	\$841,481,612	\$18,058,364	2.51	80.07	17.42
Pierson	\$8,898,710	\$7,391,371	\$6,502,515	\$175,726	0.00	28.57	71.43
Ponce Inlet	\$127,892,903	\$177,512,974	\$137,618,105	\$3,030,433	5.06	74.56	20.38
Port Orange	\$316,236,490	\$819,259,468	\$670,809,916	\$16,317,317	0.85	79.93	19.22
South Daytona	\$111,307,542	\$285,167,468	\$228,833,616	\$5,299,512	0.64	80.61	18.75
Unincorporated	\$1,872,207,118	\$2,389,812,114	\$1,595,817,377	\$37,556,445	0.67	31.17	68.16
<b>Countywide</b>	<b>\$4,824,746,464</b>	<b>\$9,094,250,309</b>	<b>\$6,687,770,136</b>	<b>\$158,690,312</b>	<b>1.22%</b>	<b>52.39</b>	<b>46.39</b>
<b>Average</b>	<b>\$184,533,709</b>	<b>\$419,027,387</b>	<b>\$318,247,047</b>	<b>\$7,570,866</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>

*\*Tax Base Exposure is based on individual city millage rates*

Figure 6: Floodplain Growth in Volusia County from 2007 DFRIM to 2011 DFRIM

The new 2011 DFIRM analysis from the 2007 DFIRM showed considerable growth of the area located within the floodplain. This, in turn, has increased overall financial exposure to the 100-Year Floodplain for 9 out of 16 jurisdictions in Volusia County. Countywide, 10,072 buildings (net) have been added to the floodplain, a 27.9% increase; over one billion dollars (net) of property value has been added, thus increasing overall financial exposure 11.6% since the 2007 DFIRM update.

Analysis found that in some jurisdictions, while the number of parcels located within the floodplain increased, the number of buildings may have decreased due to the type of parcel added to the floodplain (a parcel with no building, I.E. conservation, agriculture, undeveloped parcels). In addition, buildings may have increased while parcels decreased due to the development pattern (more than one building on a single parcel.)



Sources: FEMA, Volusia County DEM and Jurisdictions, 2013

**Table 7: Property Analysis of Parcels Located within the Volusia County Floodplain by Jurisdiction**

Municipalities	Parcels Added	Buildings Added	Land Value Added (%)	Prop. Value Added (%)	Taxable Value Added (%)
Daytona Beach	5280 (+108.8%)	4076 (+76.7%)	\$167,471,564 (+26.7%)	\$533,387,225 (+26.5%)	\$297,235,838 (+22.8%)
Daytona Beach Shores	34 (+18.8%)	24 (+13.8%)	\$12,732,045 (+16.9%)	\$17,527,104 (+13.1%)	\$17,251,104 (+15.4%)
DeBary	161 (+14.0%)	127 (+13.6%)	\$9,506,051 (+13.6%)	\$21,391,537 (+14.4%)	\$19,460,235 (+15.7%)
DeLand	(-32) (-13.5%)	(-49) (-18.9%)	(-\$2,359,372) (-5.6%)	(-\$13,075,379) (-12.1%)	(-\$3,439,580) (-6.5%)
Deltona	3451 (+154.5%)	2803 (+172.4%)	\$76,045,998 (+146.6%)	\$280,419,016 (+183.4%)	\$176,685,095 (154.3%)
Edgewater	(-162) (-12.4%)	(-152) (-13.9%)	(-\$1,538,385) (-1.4%)	(-\$14,879,226) (-8.5%)	(-\$12,421,223) (-8.8%)
Holly Hill	1774 (+265.9%)	1617 (+249.2%)	\$49,405,149 (+120.7%)	\$167,980,674 (+203.1%)	\$128,426,118 (+202.5%)
Lake Helen	(-8) (-2.7%)	(-6) (-3.6%)	(-\$2,992,843) (-28.4%)	(-\$3,541,574) (-15.9%)	(-\$3,980,989) (-26.0%)
New Smyrna Beach	(-1284) (-18.5%)	(-1104) (-19.8%)	(-\$26,109,361) (-4.9%)	(-\$127,598,044) (-11.2%)	(-\$110,210,114) (-11.6%)
Oak Hill	115 (+17.6%)	120 (+32.2%)	\$6,152,901 (+13.1%)	\$11,763,670 (+17.6%)	9,831,081 (+22.9%)
Orange City	7 (+10.9%)	7 (+8.4%)	(-\$1,832,428) (-6.9%)	(-\$807,105) (-0.9%)	(-\$494,840) (-0.9%)
Ormond Beach	80 (+1.9%)	(-27) (-0.7%)	\$17,269,138 (+3.9%)	\$18,752,894 (+2.0%)	\$21,451,962 (+2.6%)
Pierson	13 (+8.8%)	(-5) (-7.5%)	\$603,565 (+7.3%)	(-\$226,590) (-3.0%)	(-\$158,130) (-2.4%)
Ponce Inlet	0 (+0.0%)	(-3) (-0.9%)	(-\$6,138,061) (-4.6%)	(-\$6,124,493) (-3.3%)	(-\$6,472,078) (-4.5%)
Port Orange	771 (+15.7%)	650 (+13.7%)	\$21,592,361 (+7.3%)	\$25,292,478 (+3.2%)	\$17,582,410 (+2.7%)
South Daytona	1984 (+510.0%)	1944 (+519.8%)	\$62,961,308 (+130.2%)	\$201,937,284 (+242.7%)	\$152,528,545 (+200.0%)
Unincorporated	491 (+1.6%)	50 (+0.5%)	(-\$35,786,925) (-1.9%)	(-\$4,982,148) (-2.2%)	(-\$65,601,554) (-4.1%)
<b>Countywide</b>	<b>12,676 (+17.4%)</b>	<b>10,072 (+27.9%)</b>	<b>\$346,982,705 (+7.2%)</b>	<b>\$1,057,217,323 (+11.6%)</b>	<b>\$637,673,880 (+9.5%)</b>

Figure 7: Age of Structures Located within 100 Year Floodplain

### 5. PROPERTY ANALYSIS

An analysis of properties located totally, or in part, within the floodplain reveals that 28% of all parcels countywide are located in the floodplain, totaling 46,132 structures. This includes 10,361 structures (31,775 parcels) within unincorporated Volusia County and 35,771 structures (41,066 parcels) in all municipalities combined. It is important to note that 42.76% of the parcels exposed to the floodplain are undeveloped, while built parcels represent a full spectrum of development from the 1940's and forward. The largest period of growth occurred between 1969 and 1986, when 35.1% of all built parcels in the floodplain (20.08% of all parcels) were developed.

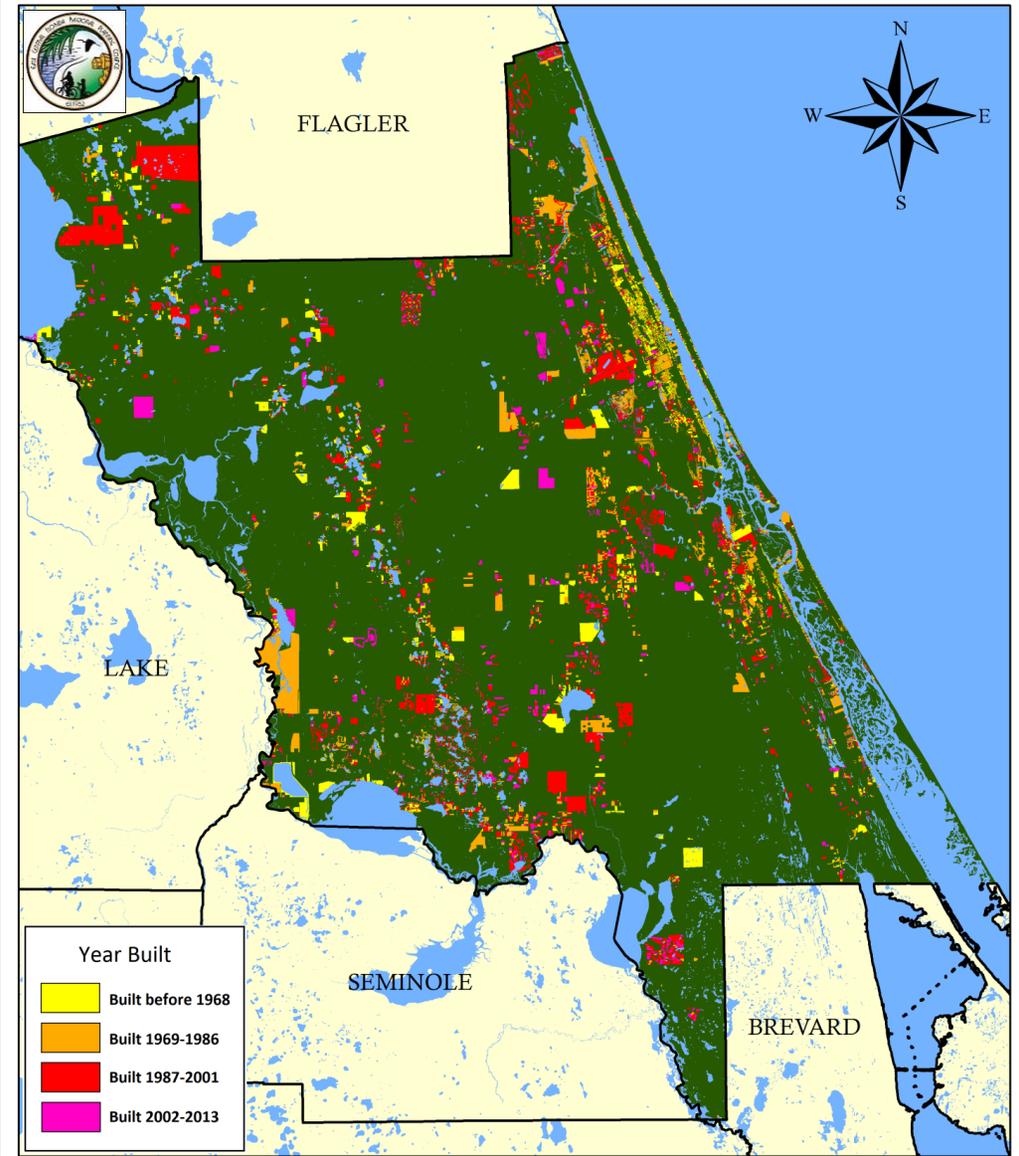
**Key Dates Include:**

**1968** – Federally-backed flood insurance became available to all Americans

**1986** – Stormwater Management ordinance amended

**2002** – Florida building code went into effect

## Age of Structures within 100-Year Floodplain



Sources: FEMA, Volusia County GIS and Jurisdictions, 2013

**Table 8: Property Analysis of Parcels Located within the Volusia County Floodplain by Jurisdiction**

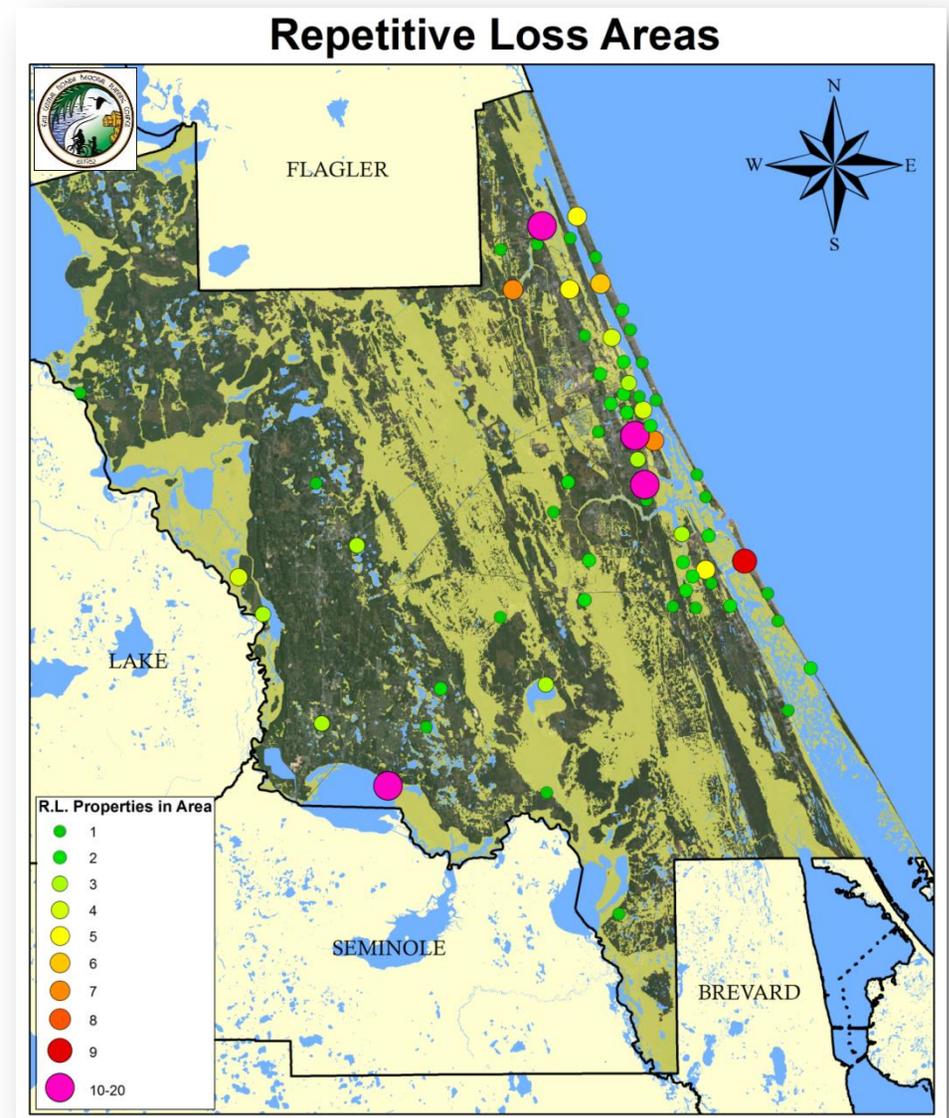
Municipality	% Parcels in Floodplain	# Parcels in Floodplain	# Buildings	% Undeveloped	% Built < '68	% Built '69-'86	% Built '87-'01	% Built '02-'13
Daytona Beach	43.39%	10,133	9,386	22.41%	33.25%	24.97%	11.04%	8.33%
Daytona Beach Shores	23.75%	214	174	29.73%	32.24%	16.82%	5.14%	6.07%
DeBary	12.97%	1,310	1,061	13.74%	15.34%	13.74%	39.47%	17.71%
DeLand	1.74%	205	210	41.95%	3.41%	4.88%	13.17%	36.59%
Deltona	14.81%	5,684	4,429	24.92%	3.99%	23.52%	34.18%	13.39%
Edgewater	10.39%	1,142	936	24.00%	13.49%	21.89%	31.52%	9.10%
Holly Hill	46.24%	2,441	2,266	17.54%	41.70%	27.86%	6.51%	6.39%
Lake Helen	17.05%	291	163	53.61%	22.68%	11.00%	7.56%	5.15%
New Smyrna Beach	39.13%	5,667	4,480	27.05%	18.21%	19.27%	19.22%	16.25%
Oak Hill	48.09%	768	492	35.67%	6.12%	25.13%	11.07%	22.01%
Orange City	1.99%	71	90	56.35%	7.04%	7.04%	14.08%	15.49%
Ormond Beach	24.04%	4,356	3,922	16.64%	13.84%	37.74%	23.56%	8.22%
Pierson	12.61%	161	62	73.10%	13.04%	9.94%	2.68%	1.24%
Ponce Inlet	34.94%	574	394	37.80%	7.49%	29.44%	17.59%	7.68%
Port Orange	24.67%	5,676	5,388	11.89%	12.72%	36.40%	26.87%	12.12%
South Daytona	47.03%	2,373	2,318	7.50%	27.69%	47.53%	13.95%	3.33%
Unincorporated	36.31%	31,775	10,361	70.06%	5.45%	10.40%	8.71%	5.38%
<b>Countywide</b>	<b>28.16%</b>	<b>72,841</b>	<b>46,132</b>	<b>42.76%</b>	<b>13.69%</b>	<b>20.08%</b>	<b>14.99%</b>	<b>8.49%</b>

## 6. REPETITIVE LOSS ANALYSIS

There are repetitive loss properties within 9 of the 16 jurisdictions within Volusia County. These 203 properties have experienced 431 total flood events, an average of 2.12 events per property. Countywide distribution of repetitive loss properties is somewhat weighted to the east, as a majority of the repetitive loss properties in the county are in the Daytona Beach, New Smyrna Beach and Ormond Beach areas (approximately 72% of incorporated parcels). The western side of the county also has a number of repetitive loss properties, most notably the cluster within the Stone Island residential area in the southwestern portion of the county. Table 9 analyzes the Repetitive properties by jurisdiction.

Data collected showed that the majority of properties have not undergone mitigation efforts; however there is insufficient data to measure an actual percentage for the entire county. Preliminary findings show, with a high degree of confidence, that the percent of repetitive loss properties that have been mitigated is well-below the 50% level.

Figure 8: Repetitive Flood Loss Areas in Volusia County



Sources: FEMA, Volusia County DEM and Jurisdictions, 2013

**Table 9: Repetitive Loss Analysis Summary by Jurisdiction**

Municipality	# RLA Properties	# RLA Losses	% RLA Mitigated	% RLA Not Mitigated	% RLA Mitigation Unknown	% RLA Insured	% RLA Not Insured	% RLA Insurance Unknown
Daytona Beach	32	64	0.00%	50.00%	50.00%	28.13%	25.00%	46.88%
Daytona B. Shores	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DeBary	3	6	0.00%	0.00%	100.00%	100.00%	0.00%	0.00%
DeLand	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Deltona	3	8	0.00%	0.00%	100.00%	66.67%	33.33%	0.00%
Edgewater	2	4	0.00%	50.00%	50.00%	0.00%	50.00%	50.00%
Holly Hill	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lake Helen	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
New Smyrna Bch.	30	60	16.67%	83.33%	0.00%	76.67%	23.33%	0.00%
Oak Hill	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Orange City	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ormond Beach	16	36	56.30%	43.70%	0.00%	50.00%	50.00%	0.00%
Pierson	0	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ponce Inlet	2	4	0.00%	0.00%	100.00%	0.00%	0.00%	100.00%
Port Orange	35	76	11.43%	88.57%	0.00%	65.71%	31.43%	2.86%
South Daytona	4	8	0.00%	0.00%	100.00%	80.00%	20.00%	0.00%
Unincorporated	76	165	0.00%	2.63%	97.37%	72.37%	27.63%	0.00%
<b>Countywide</b>	<b>202</b>	<b>431</b>						

Table 10 summarizes the land, property and taxable values as well as the Future Land Use categories for all of the repetitive loss properties in Volusia County. The average value of all Repetitive Loss Properties countywide is \$383,755. The majority of repetitive loss properties in Volusia County are residential in use, with 86.8% of all parcels falling within the Low, Medium and High Density Residential categories. Also important to note is the exposure of mixed use parcels, whose 3.4% countywide allocation exceeds that of commercial properties (2.9%).

**Table 10: Financial and Future Land Use Summary of Repetitive Loss Areas by Jurisdiction**

Municipalities	REPETITIVE LOSS AREA FINANCIAL SUMMARY			REPETITIVE LOSS AREA FUTURE LAND USE SUMMARY						
	RLA Land Value	RLA Property Value	RLA Taxable Value	% Low Density Residential	% Med-Hi Residential	% Commercial	% Mixed Use	% Recreation	% Agriculture	% Planned Development
Daytona Beach*	\$10,506,366	\$52,010,187	\$46,493,916	37.5%	34.4%	9.4%	15.6%	3.1%	0%	0%
Daytona Beach Shores	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
DeBary	\$60,000	\$229,906	\$171,906	100.00%	0%	0%	0%	0%	0%	0%
DeLand	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Deltona	\$44,112	\$111,207	\$61,358	0%	100.0%	0%	0%	0%	0%	0%
Edgewater	\$26,703	\$100,681	\$75,181	100.00%	0%	0%	0%	0%	0%	0%
Holly Hill	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Lake Helen	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
New Smyrna Beach	\$2,058,417	\$3,801,486	\$3,568,549	63.3%	30.0%	6.7%	0%	0%	0%	0%
Oak Hill	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Orange City	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Ormond Beach	\$2,517,950	\$3,514,759	\$3,288,759	87.5%	12.5%	0%	0%	0%	0%	0%
Pierson	\$0	\$0	\$0	0%	0%	0%	0%	0%	0%	0%
Ponce Inlet	\$336,539	\$745,938	\$557,937	100.00%	0%	0%	0%	0%	0%	0%
Port Orange	\$772,483	\$2,931,757	\$2,286,804	80.6%	11.1%	2.8%	2.8%	0%	0%	2.8%
South Daytona	\$600,082	\$1,153,758	\$1,103,758	50.0%	25.0%	0%	25.0%	0%	0%	0%
Unincorporated	\$8,829,424	\$14,108,780	\$12,523,349	72.4%	11.8%	0%	0%	6.6%	9.2%	0%
<b>Countywide</b>	<b>\$25,752,076</b>	<b>\$78,708,459</b>	<b>\$70,131,517</b>	<b>67.3%</b>	<b>19.5%</b>	<b>2.9%</b>	<b>3.4%</b>	<b>2.9%</b>	<b>3.4%</b>	<b>0.5%</b>

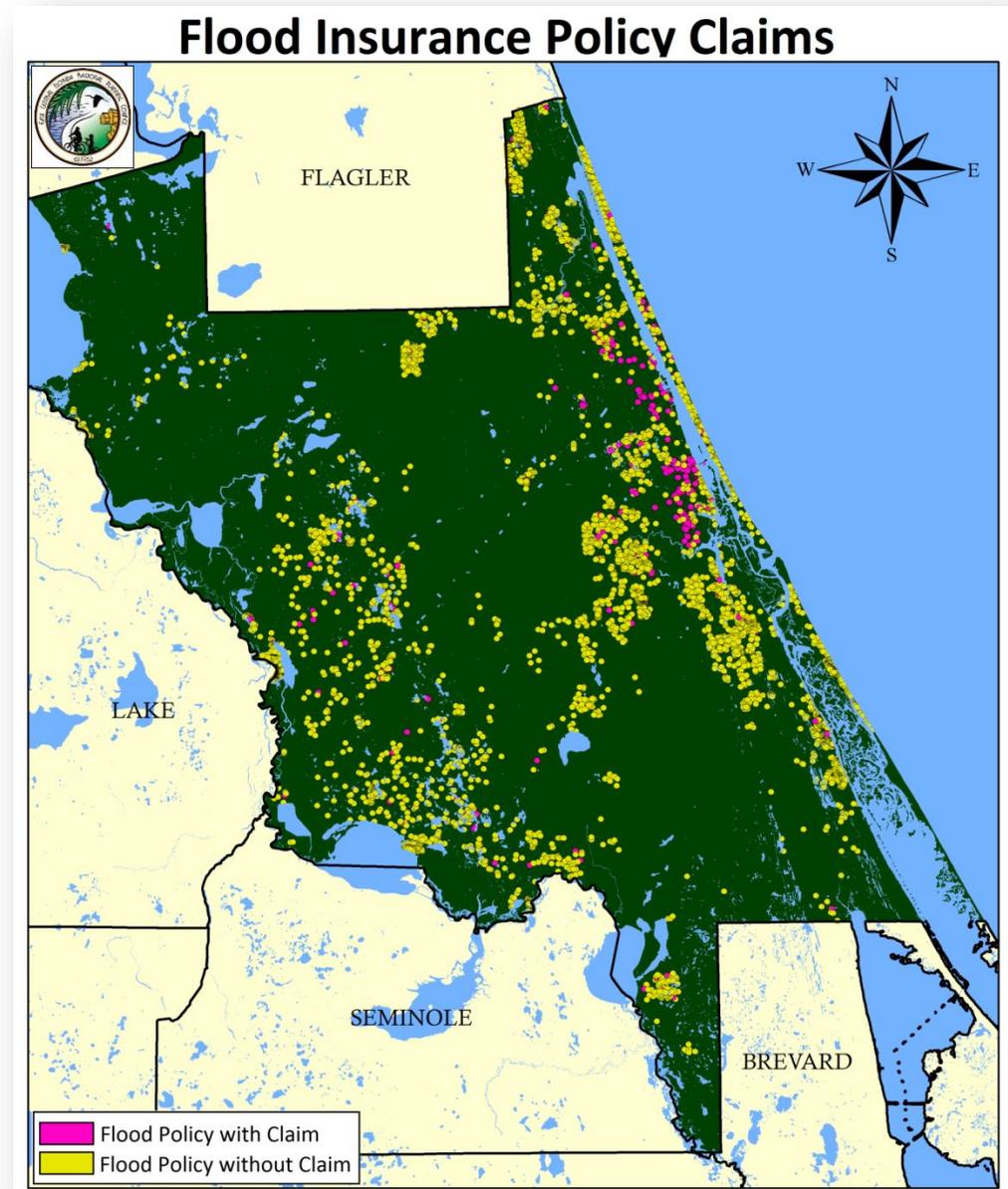
\*Note: Two beachside hotels in Daytona Beach account for \$48.2 million in property value, skewing the jurisdiction-wide value

Figure 9: Flood Insurance Policies with and without Claims

### 7. FLOOD CLAIM ANALYSIS

All jurisdictions in Volusia County participate in the National Flood Insurance Program (NFIP) and 10 participate in the Community Rating System (CRS) program as noted in Table 2. As of 2009, the number of flood insurance policies county-wide totaled 11,914. The table below breaks down the number of flood insurance policies, claims and claims paid by jurisdiction during the year 2009. There have been 1,385 flood losses reported in Volusia County through the NFIP from 1970 through November 2012, totaling more than \$35 million in claims payments. In 2009, 1,399 claims were issued, totaling \$26,515,551. These claims are for both freshwater and coastal flooding events.

It is also important to note that these numbers include only those losses to structures insured through NFIP policies and for which claims were sought and received. Following the 2004 hurricanes, 1,106 claims totaling \$14.3 million were paid in Volusia County.



Sources: FEMA, Volusia County DEM and Jurisdictions, 2013

**Table 11: Flood Insurance Claim Analysis by Jurisdiction**

<b>Municipality</b>	<b># Flood Ins. Policies</b>	<b># Flood Ins. Claims</b>	<b>Claims Paid 2009</b>
Daytona Beach	3910	548	\$9,342,422
Daytona Bch. Shores	46	1	\$13,734
DeBary	34	2	\$14,323
DeLand	72	9	\$460,364
Deltona	261	14	\$97,903
Edgewater	89	2	\$5,514
Holly Hill	23	1	\$350,000
Lake Helen	3	2	\$103,703
New Smyrna Beach	602	13	\$252,456
Oak Hill	36	0	\$0
Orange City	10	0	\$0
Ormond Beach	149	295	\$3,731,617
Pierson	4	0	\$0
Ponce Inlet	17	0	\$0
Port Orange	662	308	\$7,305,633
South Daytona	22	1	\$72,528
Unincorporated	5974	203	\$4,765,354
<b>Countywide</b>	<b>11,914</b>	<b>1,399</b>	<b>\$26,515,551</b>

Source: Volusia Count DEM, 2012

## 8. NATURAL PROTECTION

The Volusia County Comprehensive Plan and jurisdictional comprehensive plans all include a conservation element which aims to prevent the degradation of water bodies, wetlands, rivers and estuaries as well as essential upland areas. Goals and policies in the conservation elements include the protection of surface water resources and the floodplains associated with the water sources, including limiting dwelling unit densities within the floodplains and flood-prone areas. The County and the jurisdictions recognize the importance wetlands and floodplains of surface water bodies play in protecting uplands. To this effect, the protection of undisturbed segments of floodplains associated with surface water bodies shall continue through land use controls, conservation easements, public acquisition and other methods. These and other policies in the Comprehensive Plans aim to protect and utilize physical and ecological functions of natural drainage ways and patterns to protect developed areas from flood impacts. Wetland and easements maintained along water bodies not only serve as flooding buffers to development but also provide

Figure 3: Existing and Proposed Conservation Areas in Volusia County

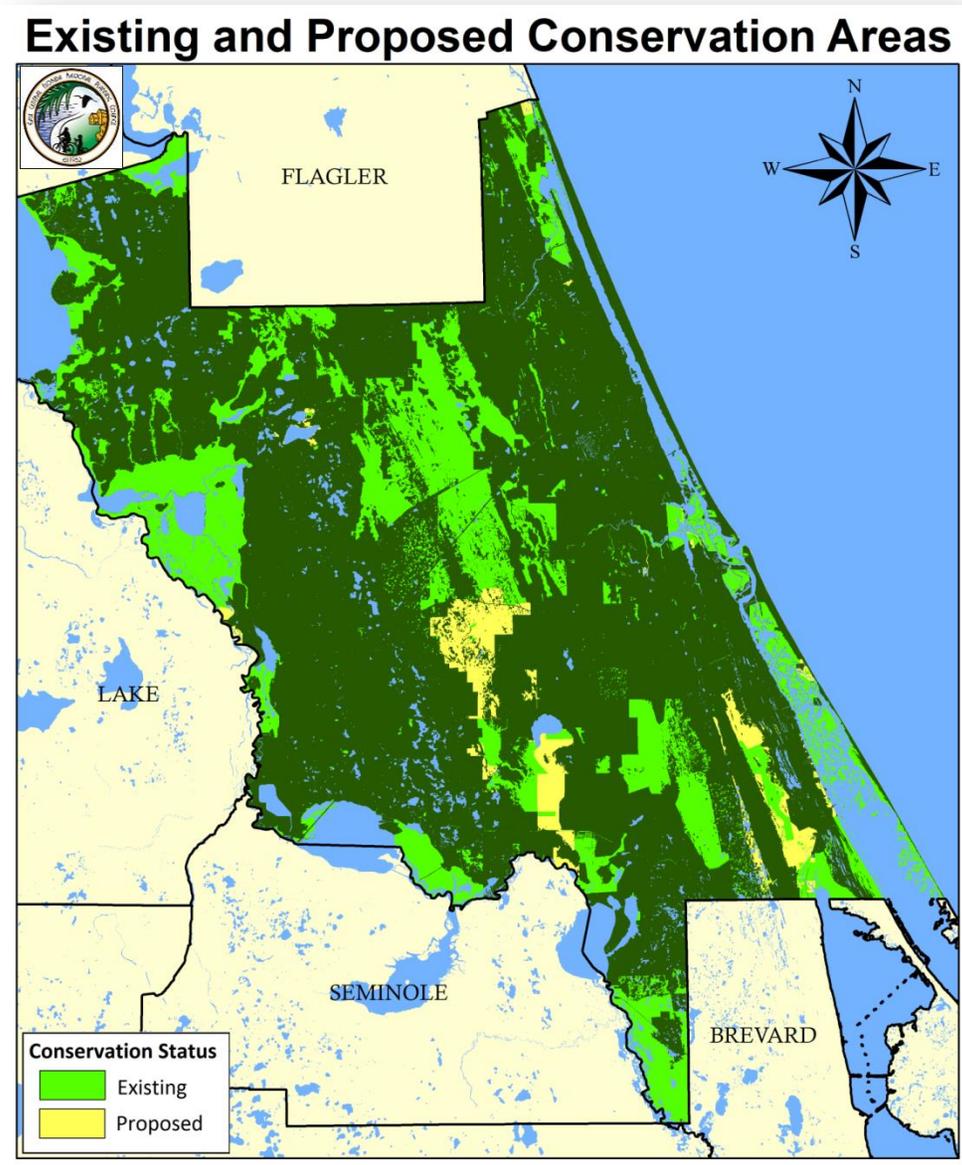


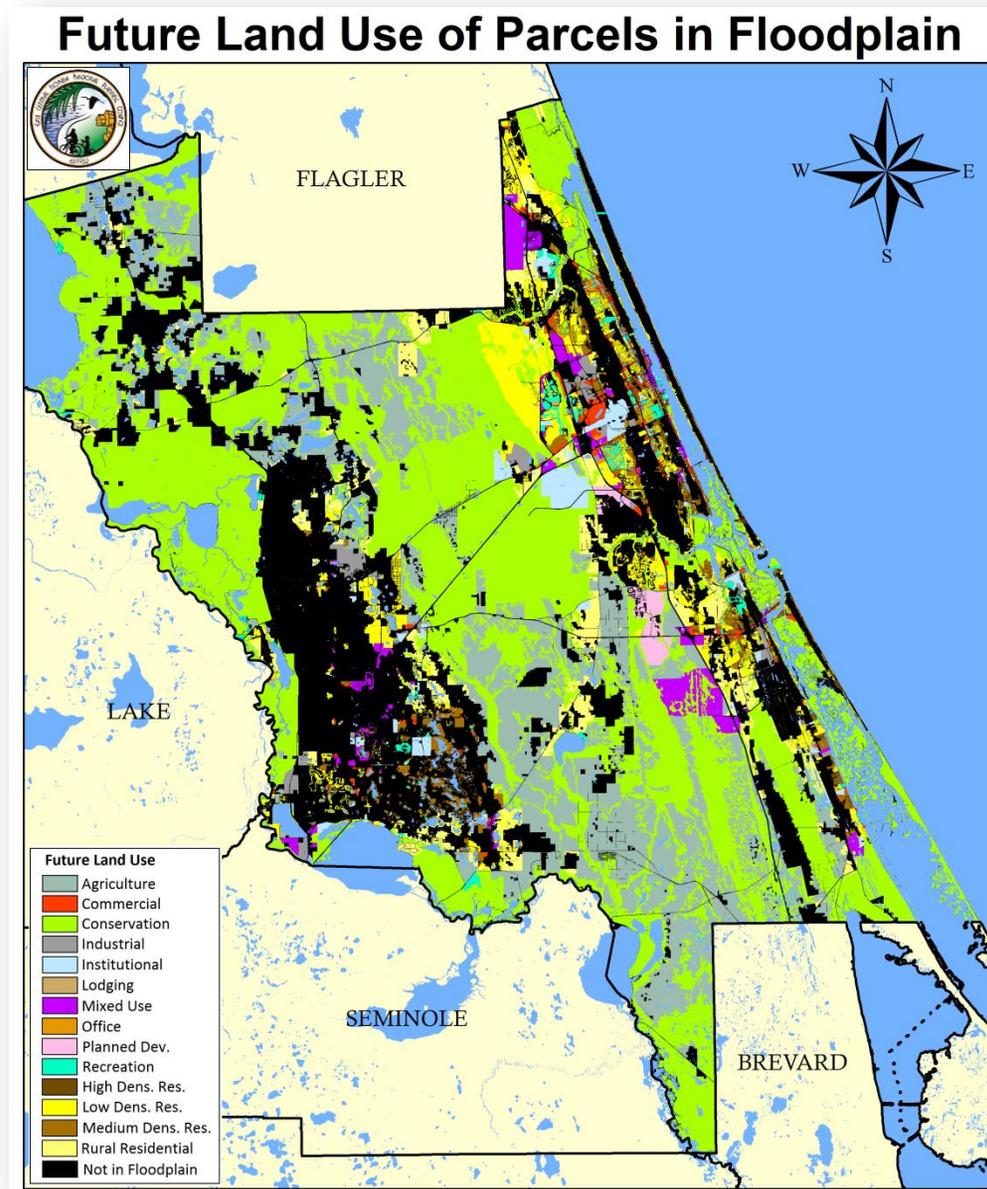
Figure 4: Future Land Use

habitat for various species which may otherwise be displaced through fill and development.

According to the analysis performed using GIS, 163,184 acres of existing conservation land (20.8% of Volusia County land) in Volusia County is exposed to the floodplain. This would be inclusive of all types of conservation properties such as wetlands and other floodplain areas. Proposed conservation lands add an additional 23,914 acres to floodplain exposed conservation lands.

### 9. LAND USE AND TREND ANALYSIS

Table 12 below summarizes the total allocation of Future Land Use Designations by acreage of all parcels exposed to the 100-Year Floodplain in Volusia County. Most of the exposed developed parcels are categorized as “Low Density Residential” (52.0% of exposed built parcels). It is important to note that conservation lands were removed from the Future Land Use analysis to provide a separate analysis. Thus, the percentages below are based on all FLU classifications excluding conservation.



Sources: FEMA, Volusia County GIS and Jurisdictions, 2013

**Table 12: Analysis of Acreage of Future Land Uses Located within the 100 Year Flood Plain**

Municipalities	L.D. Res.	Med-Hi Res.	Commercial	Mixed Use	Institution	Industrial	Planned Unit Dev't	Agriculture	Recreation
Daytona Beach	6,964	930	1,124	931	369	1,050	0	0	885
Daytona Beach Shores	0.6	11.1	0	0	.001	0	0	0	0
DeBary	215	56	60	72	65	147	1	144	1
DeLand	300	2	0	112	1	210	0	0	0
Deltona	916	2,616	105	65	371	0	0	154	97
Edgewater	324	202	15	1,984	61	63	0	0	20
Holly Hill	431	37	23	12	10	142)	0	0	87
Lake Helen	204	0	0	9	5	2	0	0	0
New Smyrna Beach	1,247	587	244	166	47	185	1,970	1,858	147
Oak Hill	246	205	41	195	81	9	0	128	28
Orange City	6	1	25	45	37	1	0	0	0
Ormond Beach	1,504	166	341	804	69	142	0	0	58
Pierson	5	0	0	0	0	0	0	182	5
Ponce Inlet	106	42	21	0	41	0	0	0	8
Port Orange	1,214	741	266	82	264	129	162	0	0
South Daytona	199	214	30	92	23	45	0	0	39
Unincorporated	13,451	982	268	86	3,416	231	0	47,439	445
<b>Countywide</b>	<b>27,333 (26.7%)</b>	<b>6,791 (6.6%)</b>	<b>2,563 (2.5%)</b>	<b>4,655 (4.5%)</b>	<b>4,861 (4.7%)</b>	<b>2,356 (2.3%)</b>	<b>2,133 (2.1%)</b>	<b>49,905 (48.7%)</b>	<b>1,820 (1.8%)</b>

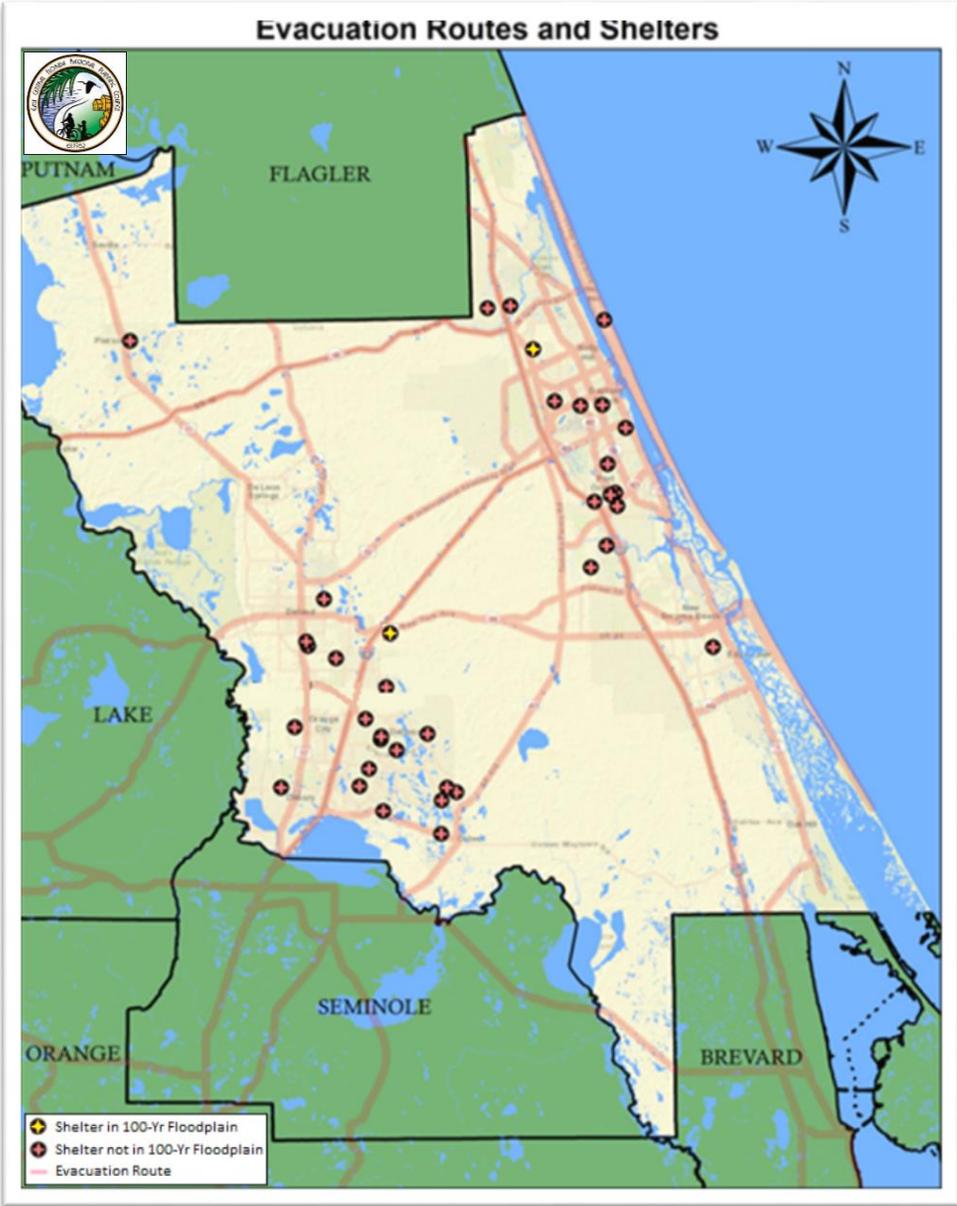
Source: Volusia County, 2012

Figure 5: Evacuation Routes and Shelters

The following map shows the evacuation routes and storm shelter locations as identified by the Statewide Regional Evacuation Study (SRES). Table 13 lists each shelter located within the floodplain area of Volusia County. It is important to note that shelters located within a floodplain may be inaccessible to the public during flooding events, either due to property flooding or the flooding of access roads.

The following evacuation routes are primary movers of traffic out of Volusia County:

- Interstate 4 (to Orlando)
- Interstate 95 (to Miami, Jacksonville)
- State Road 40 (to Lake County)
- State Road 415 (to Sanford)
- U.S. 1 (coastal)



**Table 13: List of Storm Shelters in Volusia County**

Table 13 lists all of the designated storm shelters in Volusia County.

In the event of a mass-evacuation situation in Volusia County, the roadways utilized to reach these storm shelters could become damaged or inundated by water, thus creating the need for mitigation activities that would identify shelters that have additional capacity or those that can serve excess capacity from an inundated shelter.

It is important to note that Hinson Middle School and the Volusia County Fairgrounds, both listed as shelters on this page, are located within the 100-year floodplain.

Storm Shelter Name	Address
Allen Green Civic Center	4705 Clyde Morris Boulevard., Port Orange, FL 32129
Atlantic High School	1250 Reed Canal Road, Port Orange, FL 32118
Campbell Middle School	625 S. Keech Street, Daytona Beach, FL 32114
Creeside Middle School	6801 Airport Road, Port Orange, FL 32124
Cypress Creek Elementary School	6100 S. Williamson Boulevard, Port Orange, FL 32119
Daytona Bch. Comm. College (East)	1200 W. International Speedway, Daytona Beach, FL 32724
Daytona Bch. Comm. College (West)	1156 County Road 4139, DeLand, FL 32724
DeBary Elementary School	88 W. Highbanks Road, DeBary, FL 32713
DeLand High School	800 N. Hill Avenue, DeLand, FL 32724
DeLand Middle School	1400 S. Aquarius Avenue, DeLand, FL 32724
Deltona High School	100 Wolf Pack Run, Deltona, FL 32725
Deltona Lakes Elementary School	2022 Adelia Boulevard, Deltona, FL 32725
Discovery Elementary School	975 Abigail Drive, Deltona, FL 32725
Forest Lake Elementary School	1600 Doyle Road, Volusia County, FL 32725
Freedom Elementary School	1395 S. Blue Lake, DeLand, FL 32720
Friendship Elementary School	2746 Fulford Drive, Deltona, FL 32738
Galaxy Middle School	2400 Eustace Avenue, Deltona, FL 32725
Heritage Middle School	1001 Parnell Court, Deltona, FL 32738
Hinson Middle School	1860 N. Clyde Morris Boulevard, Daytona Beach, FL 32117
Horizon Elementary School	4751 Hidden Lake Drive, Port Orange, FL 32119
James Park Youth Action Center	1700 James Street, South Daytona, FL 32119
Mainland High School	125 S. Clyde Morris Boulevard, Daytona Beach, FL 32114
Manatee Cove Elementary School	734 W. Ohio Avenue, Orange City, FL 32763
New Smyrna Beach High School	1015 N. 10 <sup>th</sup> Street, New Smyrna Beach, FL 32168
Osteen Elementary School	500 Doyle Road, Osteen, FL 32764
Palm Terrace Elementary School	1825 Dunn Avenue, Daytona Beach, FL 32115
Pathways Elementary School	2100 Airport Road, Ormond Beach, FL 32174
Pine Ridge High School	925 Howland Boulevard, Deltona, FL 32725
Pine Trail Elementary School	300 Airport Road, Ormond Beach, FL 32174
Port Orange YMCA	4701 City Center Parkway, Port Orange, FL 32129
Seabreeze High School	2700 N. Oleander Avenue, Daytona Beach, FL 32118
Spirit Elementary School	1500 Meadowlark Drive, Deltona, FL 32725
Sunrise Elementary School	3155 Phonetia Drive, Deltona, FL 32725
Sweetwater Elementary School	5800 Victoria Gardens Boulevard, Port Orange, FL 32119
T.D. Taylor Middle/High School	100 E. Washington Avenue, Pierson, FL 32180
Timbercrest Elementary School	2401 Eustace Avenue, Deltona, FL 32725
Volusia County Fairgrounds	3150 E. State Road 44, DeLand, FL 32724
Volusia Pines Elementary School	500 E. Kicklighter Road, Lake Helen, FL 32744

Sources: FEMA, Volusia County and Jurisdictions, 2013; Statewide Regional Evacuation Study (2010)

## VI. MITIGATION STRATEGY

Flood Mitigation specifically involves the managing and controlling of flood movement in an effort to prevent and control flooding. Flood mitigation is any action taken to reduce risk to people or property from flooding and its effects. The Volusia County Multi-jurisdictional Local Mitigation Strategy (LMS) has evolved over the years and not only focuses on flooding, but other natural hazards. The Volusia Prepares LMS Working Group (LMS Working Group) has developed Bylaws and Operating Procedures to formalize the LMS update process and working group. The Plan documents and represents the County's and participating local jurisdictions' sustained efforts to incorporate hazard mitigation principles and practices into the routine government activities and functions of Volusia County and its participating jurisdictions and partners. This includes documenting the goals and objectives that Volusia County deems necessary to protect people and property from hazards. At its most inner core, the Plan recommends specific actions to combat hazard vulnerability and protect its residents from losses to those hazards that pose the greatest risk.

### A. Setting Goals

The Floodplain Management Plan Committee reviewed the goals of the current Volusia County FMP and the Local Mitigation Strategy. The following goals and objectives were updated for the 2013 Volusia County Floodplain Management Plan.

#### **GOAL 1 - Prevent new development in the floodplain from increasing runoff and resulting in increases in flood volumes in the floodplain.**

Objective 1.1 Enforce the building requirements, from the National Flood Insurance Program and not allow variances that are feasibly avoidable.

Objective 1.2 Prevent new development in the floodplain.

Objective 1.3 Minimize flood hazards and protect water quality county-wide by employing watershed-based approaches that balance environmental, economic, and engineering considerations.

Objective 1.4 Protect environmentally sensitive lands and aquifers to maximize their survivability from known flood hazards where appropriate and financially feasible.

Objective 1.5 Reduce flood exposure and maximize flood protection efforts.

**Goal 2 – Develop and maintain a proactive public awareness and outreach that informs and notifies property owners that they are located in a flood zone and provides assistance and information regarding flood zones, protection of property, local drainage and sewer back-up problems.**

Objective 2.1 Create easily accessible information to educate residents about the hazards, loss reduction measures, and the natural and beneficial functions of floodplains.

Objective 2.2 Encourage land and water uses compatible with the protection of environmentally sensitive lands and coastal resources.

Objective 2.3 Review the adequacy and completeness of emergency procedures that address catastrophic flood events.

Objective 2.4 Minimize impacts from flooding in FEMA designated special flood hazard areas (i.e. flood zones starting with the letters “V” or “A”) where financially feasible.

Objective 2.5 Build a constituency that desires to see the plan's recommendations implemented.

Objective 2.6 Provide leadership in protecting low-income properties and public housing from the impacts of floods.

**Goal 3 - Continue with the Hazard Mitigation Grant Program to identify and obtain funding for both pre-and-post disaster residential mitigation projects regarding flooding.**

Objective 3.1 Identify cost-beneficial residential units for various flood mitigation grants.

Objective 3.2 Utilize “Volusia Prepares” Local Mitigation Strategy to guide and assist the County and municipalities in establishing priorities for hazard mitigation projects.

**Goal 4 – Reduce the number of repetitive loss properties within Volusia County.**

**Goal 5 - Review the locations and effects on areas that experience flooding and determine what steps, if any, the County and municipalities can take to alleviate future impacts.**

Objective 5.1 Maintain a database of flood problems and hazards, mitigation and repetitive loss claim history.

Objective 5.2 Build public and political support for projects that prevent new problems, reduce losses, and protect the natural and beneficial functions of floodplains.

Objective 5.3 Prioritize capital projects that will mitigate flood impacts in those areas of the County and municipalities that have experienced significant flooding problems.

Objective 5.4 Continue and enhance existing programs that acquire wetland areas for passive recreation uses while providing significant watershed volume storage and buffer areas from the floodplain.

**Goal 6 – Develop Floodplain Management Plans for participating CRS municipalities in Volusia County (and others as desired).**

Objective 6.1 Ensure that the recommended activities meet the goals and objectives of the community, do not create conflicts with other activities, and are coordinated with all to reduce the costs of implementing individual activities.